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HANSEN (H. N.) & SMITH (R. E.). **A bacterial gall disease of the Douglas Fir.**—*Science*, N.S., lxxvii, 2009, p. 628, 1933.

Douglas fir (*Pseudotsuga taxifolia*) trees from 3 to 15 years old in California are liable to develop twig and stem galls due to an organism resembling *Bacterium* [*Pseudomonas*] *savastanoi* [*R.A.M.*, xii, p. 521], which may increase in size for many years, sometimes killing the top or the whole tree. The globular galls, which may reach a diameter of several inches, are composed of hypertrophied tissues of the stele and cortex, with a rough, spongy, fissured surface. The non-motile bacterium is readily isolated from the gall cells, where it frequently occurs in pairs, its size averaging 1·9 to 3·9 by 0·5 to 1·5 μ. It forms white colonies with a metallic sheen, fairly smooth surface, and undulate margin. Typical galls were produced on Douglas firs by inoculation with the organism, which was subsequently re-isolated.

VAN WYK (J. H.). **An economically constructed farm shed of chemically treated wood.**—*Farming in South Africa*, viii, 85, p. 155, 1 fig., 1 diag., 1933.

Some examples are given of the utilization for construction purposes of non-durable species of timber after preservative treatment as demonstrated by the Forest Products Institute, Pretoria West. No sign of deterioration is shown after eight years' service by young, exotic, plantation-grown poles treated with a mixture of 60 per cent. oil and 40 per cent. creosote [*R.A.M.*, xii, pp. 345, 670], which have been widely used in South Africa in the erection of tobacco and farm sheds and the like. Details are given of the costs of treating the different timbers required for building purposes, and of the construction of a farm shed with treated wood recently erected at the Institute.

WINKELMANN (A.). **Zur Frage der Gemüsesamenbeizung.** [On the question of vegetable seed disinfection.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 13, pp. 246–247, 1933.

In connexion with recent experiments by himself and others on the disinfection of vegetable seeds, the writer discusses the question of the limits of tolerance for certain preparations. Lettuce seed is liable to injury from germisan (30 minutes' immersion at 0·125 per

cent.) [*R.A.M.*, xii, p. 264] and uspulun (0·25 per cent.). Uspulun (0·25 per cent., 30 minutes' immersion) caused injury to tomato seed amounting to over 50 per cent. in two cases, but germisan proved fairly safe, though sometimes causing slight injury. Carrot and cucumber seeds usually withstood uspulun well but were injured by 30 minutes in 0·25 per cent. germisan. The dusts abavit B, ceresan, tillantin R, and tutan were satisfactory with carrots, cucumbers, and peas. Beans [*Phaseolus vulgaris*] were readily injured by germisan (0·25 per cent. solution for 30 minutes) and tutan dust, while with uspulun, abavit B, ceresan, and tillantin R, slighter damage was sustained.

GIBBS (J. G.). **Weed host plants of club-root in New Zealand.**—*New Zealand Journ. of Agric.*, xliv, 4, pp. 273–276, 1932.

Seeds of a number of cruciferous weeds collected during the summer of 1928–9 were sown on soil infested by the finger-and-toe organism (*Plasmodiophora brassicae*) in order to determine their part, if any, in the perpetuation of the fungus under New Zealand conditions [*R.A.M.*, xii, p. 412]. A table is given showing the results of four tests, with notes on the outcome of similar experiments by other workers. Four of the susceptible plants are believed to be hitherto unrecorded as hosts of *P. brassicae*.

In one test, in which finger-and-toe developed profusely on most species, the roots of plants of those species resisting infection were dipped in a spore suspension of the fungus and transplanted to heavily infested boxes. The species maintaining their resistance under these conditions were *Barbarea verna*, *B. stricta*, *B. vulgaris* [ibid., xii, p. 346], and *Coronopus didyma*.

By dipping the roots of seedlings in a spore suspension before planting in healthy soil, it was ascertained that the cultivated hosts of *P. brassicae* in New Zealand include swedes, turnips, thousand-headed and Buda kale, chou moellier, mustard, cabbage, cauliflower, broccoli, and Brussels sprouts. Infection was secured in every case by the distribution over rape plants [*Brassica napus*] in sterilized soil of spore suspensions from tumours on *Brassica arvensis*, *B. campestris*, *B. oleracea*, *Diplotaxis tenuifolia*, *Cheiranthus cheiri*, *Lunaria biennis*, *Lepidium campestre*, *Sisymbrium orientale*, and *Arabis albida*.

The practical significance of susceptible weeds as a means of perpetuating the fungus is briefly discussed.

BLANK (L. M.) & WALKER (J. C.). **Inheritance of Fusarium resistance in Brussels Sprouts and Kohlrabi.**—*Journ. Agric. Res.*, xlvi, 11, pp. 1015–1022, 1933.

The study [details of which are given] during three consecutive years in Wisconsin of the inheritance of resistance to cabbage yellows (*Fusarium conglutinans*) in commercial varieties of Brussels sprouts (*Brassica oleracea gemmifera*) and kohlrabi (*B. o. caulo-rapa*) indicated that in these two hosts, as previously shown for both wild and cultivated cabbage [*R.A.M.*, xii, p. 608], resistance to the disease is based on a single-factor difference, a further inference being that this factor is probably carried by the same gene in all four sub-species of *B. oleracea*. The whole

work is considered to demonstrate the possibility of breeding homozygous resistant lines of Brussels sprouts and kohlrabi from resistant individuals grown on yellows-infected soil.

YOSHII (H.). **On three species of Alternaria parasitic on cruciferous plants.**—*Bull. Sci. Fakultato Terkultura, Kjusu Imper. Univ.*, v, 3, pp. 221–235, 5 figs., 1933. [Japanese, with English summary.]

The species of *Alternaria* parasitic on crucifers in Japan are classified as follows: *Alternaria brassicae* (Berk.) Sacc. (with which *A. oleracea* and *A. circinans* (B. & C.) Bolle are regarded as synonymous), *A. brassicae* var. *macrospora* Sacc., and *A. herculea* (the synonyms of which are *Macrosporium brassicae* var. *macrospora* Eliasson, *Sporidesmium brassicae*, *A. brassicae* (Berk.) Bolle, and *A. macrospora* (Sacc.) Sawada) [*R.A.M.*, xii, p. 546]. Authentic cultures of Bolle's species [ibid., iv, p. 60] were obtained from the Centraalbureau voor Schimmelcultures for purposes of comparison. *A. brassicae* attacks mainly cabbage (*Brassica oleracea* and allied species); its spore dimensions are 15 to 86 by 8 to 22 μ. *A. herculea* occurs on *B. chinensis*, *B. rapa* [*B. campestris*], *B. napella* [*B. campestris*], cabbage, and radish; its spores measure 70 to 260 by 14 to 26 μ. *A. brassicae* var. *macrospora*, found on radish and cabbage (*B. oleracea*, *B. chinensis*, and related species), is characterized by medium-sized spores, 60 to 150 by 10 to 23 μ.

STARR (G. H.) **A study of diseases of canning crops (Peas and Corn) in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 89, 51 pp., 12 figs., 2 graphs, 1932. [Received September, 1933.]

This is a comprehensive report of the author's investigations from 1926 to 1931 of the diseases affecting field peas and sweet maize, especially those grown for canning, in Minnesota. While peas were found to be occasionally attacked by most of the usual diseases known on this crop in the United States, the bacterial blight (*Pseudomonas pisi*) [*R.A.M.*, xii, p. 412], root rot (*Fusarium martii* var. *pisi* and *Aphanomyces euteiches*) [ibid., xii, p. 413], and seedling blight (*Rhizoctonia* and *Fusarium* spp.) are probably the most prevalent in Minnesota. Special attention was given to *Fusarium* wilt, which shows indications of becoming one of the most destructive diseases in the State. Isolations and pathogenicity tests showed that in Minnesota the wilt is caused by several species of *Fusarium*, among which *F. orthoceras* var. *pisi* [ibid., xii, p. 547] is the most widespread; another species frequently isolated from wilted plants in the field was identified as *F. bullatum* Sherb. (*F. equiseti* var. *bullatum* Wr.) [ibid., x, p. 626] and was shown to cause a rapid wilt of young pea plants; while a third, identified as *F. acuminatum* Ell. and Ev. (*F. scirpi* var. *acuminatum* Wr.) [loc. cit.], also caused a wilt in several varieties of peas, but appeared to be less virulent than the other two. The largest number of wilted pea plants occurred at 28° C. with two strains and at 24° with a third, and in the wettest soil tested, though varying amounts of soil moisture had only a slight effect on the development of the disease; the optimum soil reaction

appeared to be P_H 8·52 but some disease occurred between 5·07 and 9·69. There was evidence of variations in the varietal resistance of peas to wilt, and several single-plant selections are being studied for resistance and trueness to type. Transmission of the *Fusarium* wilt by means of the seed was demonstrated: the fungi were found in the seed-coat but not in the cotyledons or embryos of peas collected from wilted plants.

The most common diseases of sweet maize observed in Minnesota were smut (*Ustilago zeae*), rust (*Puccinia sorghi*) [*P. maydis*: ibid., xi, p. 170], and root rot and seedling blight (*Gibberella saubinetii*) [ibid., xii, p. 505], of which the first- and last-named appear to be the most destructive. Organic mercury dusts at the rate of 2 or 3 oz. per bushel of seed-grain were found to be the most satisfactory in the control of seedling blight. Seed-grain harvested before full maturity or dried at too high a temperature showed a predisposition to the blight.

CARSNER (E.), ABEGG (F. A.), CORMANY (C. E.), ELCOCK (H. A.), KELLER (W.), LOWE (C. C.), OWEN (F. V.), PACK (D. A.), PRICE (C.), & SKUDERNA (A. W.). **Curly-top resistance in Sugar Beets and tests of the resistant variety U.S. No. 1.**— *U.S. Dept. of Agric. Tech. Bull.* 360, 68 pp., 4 figs., 1 graph, 1 diag., 1 map, 1933.

An important advance in the production of a commercial variety of sugar beet resistant to curly top [*R.A.M.*, xi, p. 162; xii, p. 349] is marked by the release by the United States Department of Agriculture of a new variety, U.S. No. 1. This is derived from a combination of resistant strains, including '5001', obtained from an extensive mass selection from severely affected fields in Idaho and Utah during the epidemic of 1926, the 'Washington strain' obtained from a large primary mass selection made from commercial fields in the Yakima valley in 1923, the inbred line 905a2, several first-generation hybrids between this and other strains, and the three strains 6677–24, 3929, and De Rekowski.

In an extensive series of tests conducted in 1931 under conditions where curly top was an important factor, U.S. No. 1 gave average yields of 14·8, 20·9, 23·8, and 13·4 tons per acre for Idaho, Utah, California, and New Mexico, respectively, the corresponding figures for the commercial varieties used being 10·1, 13·2, 17·3, and 6·7. Where curly top, however, was absent or negligible, the average difference in yield between U.S. No. 1 and the commercial varieties was only 0·5 ton per acre in favour of the former.

The average sucrose percentage of U.S. No. 1 was lower by a fraction of one per cent. than that of the commercial brands, but there was no significant difference in purity.

The drawbacks to the new variety are that its resistance is not complete and that it tends to 'bolt', though in this respect it may be greatly improved by additional selection. While it is not yet to be regarded as a finished product, its general adoption should give an appreciable degree of curly top control and is recommended until a better variety has been produced from the other strains now being tested.

BREMER (H.). **Ueber den Zwiebelrotz.** [On the Onion slime.]—*Die Kranke Pflanze*, x, 7–8, pp. 97–99, 3 figs., 1933.

The information in this brief note on the 'Rotz' or slime disease of onions in Germany has already been noticed from other sources [*R.A.M.*, ix, pp. 223, 620; x, p. 329].

PIRONE (P. P.), NEWHALL (A. G.), STUART (W. W.), HORSFALL (J. G.), & HARRISON (A. L.). **Copper seed treatments for the control of damping-off of Spinach.**—*Cornell Agric. Exper. Stat. Bull.* 566, 25 pp., 6 figs. (1 on cover), 8 graphs, 1933.

After a brief reference to the considerable financial losses caused to spinach growers in New York by damping-off, most commonly associated with *Pythium ultimum* [*R.A.M.*, xi, p. 344], the authors give a detailed account of their experiments on the control of the trouble by seed treatment. The results showed that damping-off was successfully checked either by soaking the seed for an hour in 1 per cent. copper sulphate solution or by dusting it with red (cuprous) oxide of copper [cf. ibid., xii, p. 232] at the rate of one level teaspoonful of the powder to 1 lb. (or 1 lb. to 65 lb.) of seed, care being taken to coat the latter thoroughly with the dust. In field tests on more than twenty farms in 1932 the average increase in yield of spinach resulting from either treatment amounted to over two tons per acre. Both treatments also gave promising results in preliminary experiments on the control of seed-borne diseases of a number of other vegetables, including beet, cucumber, melon, squash, tomato, eggplant, pepper, Lima bean, and pea; and in the case of spinach their cost is stated not to have exceeded 25 cents per acre.

Somewhat less favourable control was obtained by seed treatment with other fungicides, including copper carbonate, semesan, monohydrated copper sulphate, calomel [mercurous chloride], and mercuric oxide dusts, and with mercuric chloride solution.

YOSHII (H.). **Pathological studies on Watermelon wilt. I. On the mode of infection of the causal fungus, Fusarium niveum, E.F.S.**—*Bull. Sci. Fakultato Terkultura, Kjušu Imper. Univ.*, v, 3, pp. 313–326, 12 figs., 1933. [Japanese, with English summary.]

Fusarium niveum, the agent of watermelon wilt [*R.A.M.*, xii, p. 418], first invades the root cap, passing thence to the primordial meristem, or it may directly attack the primary meristem. From the latter it enters the stele, passing through and between the meristematic cells, though in its passage into the root through the root cap or the young piliferous layer it is always intercellular. Once within the stele, the fungus progresses actively along the xylem elements, destroying the tissues and so inducing the wilt. When the primary cortex is invaded through the young piliferous layer, a blight of the parenchyma may result, but the stele cannot be entered from this tissue owing to the early suberization of the endodermis. Penetration into the cortex at a later stage is prevented by the suberization of the exodermis, which occurs as soon as the root hairs have ceased activity. The fungus may, however, invade the root cortex through the rupture produced by the

emergence of a secondary root, but here again the stele is protected by the endodermis, the suberization of which is stimulated by the emergence of the new root. The penetration of the root cap and invasion of the meristematic tissue may occur within 16 hours at 23° C. The term 'meristematic infection' is specially applicable to the action of *F. niveum*, which is dependent for its further progress within the vascular tissues on invasion of the meristematic tissue [cf. ibid., x, p. 379].

WATANABE (T.). **Studies on some characters of Corticium centrifugum parasitic on Calabash plant.**—*Bull. Utsonomiya Agric. Coll.*, Nippon, *1933*, 3, pp. 1–16, 1 pl., 1933.

The author gives a brief historical review of the literature dealing with the identification of the perfect stage of Japanese strains of *Sclerotium rolfsii* Sacc. with *Corticium centrifugum* (Lév.) Bres. [but without reference to Curzi's recent work on *S. rolfsii* and allied forms in Italy and the United States: *R.A.M.*, xi, p. 748]. This is followed by a fully tabulated account of his morphological and physiological studies of a sclerotial fungus identified as *S. rolfsii* which causes a serious disease of calabash (*Lagenaria vulgaris* var. *depressa*) near Utsonomiya, Japan. The plants are attacked in the field about the middle of August, when the silky, white mycelium appears on the stems at soil level. The surface of the affected areas assumes a brown, water-soaked discoloration of irregular extent, later becoming somewhat sunken; gum is exuded and eventually the diseased parts undergo severe necrosis. The upper parts of the stem frequently wilt, and as infection progresses the whole plant dies. Numerous vinaceous-fawn, spherical, ellipsoid, or irregular sclerotia, averaging 0·66 by 0·83 mm., are produced on the diseased areas. The sclerotia consist of an outer zone of one or two layers of yellowish-brown, roundish, polygonal or irregular cells and an inner one of three or four layers of hyaline or light brown, hexagonal or polygonal cells, intermingled with some elongated or dumb-bell shaped, hyaline mycelial elements. Of the 20 different media used for the culture of *S. rolfsii*, Japanese soy-bean and apricot decoctions, with and without the addition of agar, proved the most favourable, followed by carrot, potato, and calabash. The minimum, optimum, and maximum temperatures for mycelial growth were found to be 11° to 15°, 28°, and above 38° C., respectively.

Inoculation experiments with the fungus on paddy and upland rice, tomato, pepper [*Capsicum annuum*], broad beans [*Vicia faba*], squash [*Cucurbita* sp.], *L. vulgaris* vars. *microcarpa* and *clavata*, watermelon, *Luffa cylindrica*, and sweet potato gave positive results [cf. ibid., xi, p. 349].

WATANABE (T.). **Vitality of Corticium centrifugum parasitic on Calabash plant.**—*Bull. Utsonomiya Agric. Coll.*, Nippon, *1933*, 3, pp. 17–27, 1933.

The sclerotia and mycelium of *Sclerotium rolfsii* from calabash (*Lagenaria vulgaris* var. *depressa*) in Nippon, Japan [see preceding abstract], were found to survive the winter in the soil, on the host, and on culture media in the laboratory. Immersed in

water, the sclerotia were destroyed in 50 minutes at 50° C. and the mycelium in 30 minutes at 45°; in the air a period of 60 minutes was necessary to kill the sclerotia and 20 minutes for the mycelium. The sclerotia of *S. rolfsii* were destroyed within 45 minutes by immersion in 0·1 per cent. corrosive sublimate and the mycelium in 15 minutes at 0·01 per cent. Formalin killed the sclerotia in 150 minutes at 0·5 per cent., in 60 at 1, and in 30 at 3 per cent., the mycelium being destroyed by this solution at 0·5 per cent. in 15 minutes. Caustic potash was effective at 1 per cent. in 15 minutes for the sclerotia and at 0·5 per cent. in the same time for the mycelium.

CHARLES (VERA K.) & LAMBERT (E. B.). **Plaster moulds occurring in beds of the cultivated Mushroom.**—*Journ. Agric. Res.*, xlvi, 12, pp. 1089–1098, 4 figs., 1933.

This is a brief account of the authors' study in pure culture of two injurious moulds (respectively designated as the 'white' and the 'brown' plaster moulds) which are stated to be commonly present in mushroom [*Psalliota campestris*] beds in the United States. The first and most dangerous of the two was identified as *Monilia fimicola* Cost. & Matr., a name which the authors prefer to *Oospora fimicola* Cub. & Megl. [*R.A.M.*, xii, p. 352]. All the collections of this fungus from various localities in the United States and one from England were morphologically identical, but there were considerable cultural differences, and flask cultures were frequently observed to give rise to sectors. As an illustration of the economic importance of this disease, it is stated that a grower in California suffered a loss estimated at from $20,000 to 30,000 in a period of four years owing to its ravages.

The brown mould (typically a surface grower both in nature and on culture media) forms at first white, later tan, and finally cinnamon-brown patches, 6 to 15 inches in diameter, on the surface of the mushroom beds, sometimes coalescing to form a continuous coating over the surface of the compost. The mushroom mycelium appears to have considerable difficulty in penetrating these patches, so that the growth is delayed and the yield reduced. The fungus, so far as the writer is aware, has not been recorded in Europe in connexion with mushroom growing. It was identified as *Myriococcum praecox*, a sclerotial fungus described by Fries in 1823, the systematic position of which is obscure.

Although *Monilia sitophila* [ibid., x, p. 502] occasionally occurs in the United States as a contamination of mushroom spawn, it is seldom, if ever, found in composted manure in association with the white and brown plaster moulds.

VENKATARAYAN (S. V.). **Downy mildew. A serious disease of Grape Vines in Mysore.**—Reprinted from *Journ. Mysore Agric. & Exper. Union*, xiii, 3, 4 pp., 1 pl., 1933.

A popular note is given on the symptoms of downy mildew of the vine (*Plasmopara viticola*) in Mysore, where the disease was first observed in 1931 and is stated to be spreading extensively [cf. *R.A.M.*, xi, p. 622], and on its control by spraying with Bordeaux mixture.

BEAUMONT (A.) & STANILAND (L. N.). **Ninth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1932.**—43 pp., 4 figs., 1933.

Owing to cold weather early in the year leaf spot of oats (*Helminthosporium avenae*) [*R.A.M.*, xi, p. 294] was exceptionally prevalent in 1932 in Devonshire, where, though there was a general recovery with the onset of warmer weather, some fields had to be resown. The soil in the affected areas contained insufficient potash and nitrates, the cold accounting for the deficiency of the latter. Glume blotch of wheat (*Septoria nodorum*) was observed for the first time in Devon. Chocolate spot [*Bacillus lathyri*: ibid., xi, pp. 143, 555] of broad beans [*Vicia faba*] caused heavy losses in several localities, most of the affected fields being deficient in potash. In early spring a bowling green in east Devon showed brown patches caused by *Fusarium nivale* [*Calonectria graminicola*: ibid., xi, p. 246]. Spotted wilt of tomatoes [ibid., xii, p. 730], introduced on plants from Cambridge, was noted for the first time in south-western England, and did very serious damage at Penzance. Raspberry mosaic [ibid., xii, p. 771] was increasingly prevalent, especially on Lloyd George canes. *Stagonospora curtisii* [ibid., xi, p. 786] caused leaf scorch of belladonna lily [*Amaryllis belladonna*], this being the first record of the disease on this host in Great Britain. Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [ibid., xii, pp. 737, 794] was observed near Totnes, and in two localities in the vicinity plane trees were attacked by *Gloeosporium nervisequum* [*Gnomonia veneta*: ibid., xii, p. 735].

The meteorological data obtained again confirmed the value of the Dutch rules for forecasting extensive outbreaks of potato blight [*Phytophthora infestans*: ibid., xi, p. 559]. A better indication of the severity of the outbreaks was, however, given by the relative daily humidity (taken preferably at 3 p.m., when a high humidity generally indicates high humidity all day), widespread attack being indicated if this did not fall below 75 per cent. for at least two successive days, provided that the temperature was not too low. In 1929, such two-day high humidity periods occurred on about 1st and 28th July, and 3rd, 9th, and 22nd to 31st August; blight broke out on 11th July, made little progress owing to warm, dry weather, and then became general during the second week in August. In 1930, the critical two-day periods were about 10th and 20th June, 3rd, 20th, 23rd, 27th July, 2nd, 8th, and 17th to 29th August; blight appeared extensively early in August. In 1931, the first favourable period was from 4th to 12th June and the disease appeared on a large scale at the end of that month. When the 1932 humidity data for West Cornwall and Devon were combined, the daily readings for the period from 19th to 22nd May were respectively, 99, 81, 81, and 83 per cent. Widespread blight was, accordingly, expected at the end of May, and actually broke out on 30th. The humidity method of forecasting blight is thus very successful in Devon and Cornwall, though in the former locality the earlier critical dates are less reliable than the later ones.

In both counties finger-and-toe disease [*Plasmodiophora bras-*

sicae: ibid., xii, p. 412] has been observed on turnip, swede, cabbage (including ox-cabbage), Brussels sprouts, broccoli [*Brassica oleracea* var. *botrytis*], cauliflower, kohlrabi [*B. oleracea* var. *caulo-rapa*], and charlock [*B. sinapis*]. Bruce turnips and Balmoral swedes (the latter from Aberdeen) were highly resistant. On infected land the safest *Brassica* crop is marrow stem kale [*B. oleracea* var. *acephala*] which even when grown in proximity to diseased swedes has often given good results. Infection is commonest in rather acid soils (P_H 5·5 to 6·3), but is also found, even in swedes, in soils not short of lime, while in broccoli it is commoner in soils adequately provided with lime than in others. To effect control, lime must be applied in the active form and be harrowed in immediately. Hydrated lime (1 ton per acre) gave excellent control in one instance, while in a pot test with cabbage plants quicklime gave better results than hydrated lime or limestone.

Jahresberichte der Preussichen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe). Jahrgänge 1931–32 und 1932–33. [Annual Reports of the Prussian Agricultural Experiment and Research Stations at Landsberg (Warthe) for the years 1931–32 and 1932–33.]—*Landw. Jahrb.*, lxxvii (Supplement), pp. 3–40, 1933.

This report contains some notes on manurial experiments in progress in connexion with lupin chlorosis [see below, p. 32] and potato scab [*Actinomyces scabies*: see below, p. 51], together with observations and experiments on the spread and control of some common diseases of plants in the area covered by the Stations.

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu Geisenheim a. Rh, für die Rechnungsjahre 1931–32. [Report of the Viticultural, Fruit Growing, and Horticultural College and Research Institute at Geisenheim-am-Rhein for the financial years 1931–32.]—*Landw. Jahrb.*, lxxvii (Supplement), pp. 217–247, 1933.

The following items of phytopathological interest occur in this report. Hydrangea flowers were extensively affected by a green discoloration and the condition, which was found to be transmissible by grafting, is believed to be caused by a virus. It was impossible to obtain marketable plants from the progeny of the diseased individuals. Experiments with the Madame Mouillère variety (on which the discoloration was most pronounced) showed that neither alum nor nitrogen is responsible for the disorder.

Inoculation experiments on elms (*Ulmus hollandica* and *U. vegeta*) with *Graphium* [*Ceratostomella*] *ulmi* gave positive results on the former only [*R.A.M.*, xii, p. 665]. So far the infected trees have made normal growth in the years following inoculation, except for the death of a few shoots just above the site of the operation.

Uncommon diseases observed during the period under review included *Diplodia rosarum* causing spotting of the shoots and peduncles of roses [ibid., vi, p. 488]; *Marssonina potentillae*, the agent of a leaf spot of strawberries in Hanover and Middle Rhine;

and *Pyrenochaete pubescens* damaging the bark of young lime trees [*Tilia*] in Silesia.

The inoculation of certain varieties of vine with *Bacterium tumefaciens* resulted in the development of tumours ranging from the size of a pea to that of a walnut [ibid., xi, p. 655], those most severely affected being Solonis × Gutedel 42 G. pseudo-form, Berlandieri × Riparia Teleki c, Solonis × York Madeira 162 G. from Tiefenbach, Solonis × York Madeira 161, and Riesling × Solonis × Frühburgunder 95 G.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1932.** [Report on the activities of the Phytopathological Service in the year 1932.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 72, 148 pp., 8 pl., 1933.

This report, prepared on the usual lines [*R.A.M.*, xi, p. 766], contains numerous items of interest of which the following may be mentioned. Wheat was again severely injured by *Septoria nodorum* [loc. cit.] on sandy and marshy soils, a marked feature of the disease being its tendency to occur in patches.

Two forms of the yellowing disease of beets [ibid., xi, p. 767] may be distinguished, of which one has been found by [E.] Brandenburg to be due to a *Pythium* [see below, p. 57] causing a black discoloration of the xylem besides chlorosis of the leaves, which finally die [ibid., x, p. 487]. Confusion has arisen between this disease and yellowing proper, in which the rotting action of *Clasterosporium* (*Pleospora*) [*Sporodesmium*] *putrefaciens* is purely secondary [ibid., x, p. 293]. A third type of obscure disturbance observed in 1930 [ibid., xi, p. 96] appears to be curable by the application of manganese sulphate to the soil, suggesting analogies with the reclamation disease of oats.

Blue maw bird-seed [*Papaver somniferum*] was severely attacked by *Dendryphium penicillatum* [ibid., viii, p. 548] in the Oudenbosch district, where only some 15 per cent. of the plants remained free from infection.

Lettuces exported from Bussum to England were found on arrival to bear aecidia of the rust *Puccinia opizii* [ibid., ix, p. 86], the uredo- and teleutospores of which are formed on the sedge *Carex muricata*. Little damage is caused by the disease, but an urgent warning has been circulated to exporters to avoid the inclusion of affected plants in consignments to foreign countries.

Spinach leaves at Sappemeer again showed the white spotting attributed to *Cladosporium macrocarpum* [ibid., xi, pp. 222, 767], which was found to be transmitted by the seed.

Rhabdocline pseudotsugae is stated to be spreading on Douglas firs [*Pseudotsuga taxifolia*] and causing considerable injury [ibid., xii, p. 63].

Details are given of a number of investigations and experiments in the control of various important diseases. Shirlan H.B., with the addition of 0·2 per cent. agral I (Imperial Chemical Industries, Ltd.), was tested against leaf mould of tomato (*C. fulvum*) [ibid., xii, p. 403], tulip 'fire' (*Botrytis tulipae*) [ibid., xii, p. 96], cucumber leaf and fruit blight [*C. cucumerinum*: ibid., xii, p. 485], and

apple and pear scab [*Venturia inaequalis* and *V. pirina*]. Tomato plants at Naaldwijk treated with shirlan (several applications at 0·1 per cent.) presented a very satisfactory appearance in comparison with the controls, especially at first; later leaf mould developed extensively in both lots, but unlike lime-sulphur the new preparation caused no spotting of the fruits. The results in the tulip tests were conflicting, being very good in certain localities, e.g., Zwaag, where the yield of a bed sprayed six times at 0·2 per cent. was nearly double that of an untreated bed, and much less satisfactory in others. Shirlan (0·15, 0·2, and 0·3 per cent.) failed to control *C. cucumerinum* but was effective against both apple and pear scab (one experiment only with each); it caused some injury, however, to pear leaves (Louise bonne d'Avranches and Doyenné du Comice varieties).

NEUWEILER (E.). **Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Oerlikon für das Jahr 1931. IV. Pflanzenschutz.** [Report on the work of the Federal Agricultural Experiment Station Oerlikon for the year 1931. IV. Plant protection.]—*Landw. Jahrb. der Schweiz*, xlvii, 7, pp. 867–871, 1933.

Good control of wheat bunt (*Tilletia tritici*) [*T. caries*] is stated to have been given in three years' tests at Oerlikon, Switzerland, by ceretan [ceresan], while in 1931 porzol A and H dusts (Chinoin, Ujpest, Hungary) [*R.A.M.*, viii, p. 710] proved moderately satisfactory. Helion (Gesellsch. Chem. Indus., Basel) and cupro-maag (Dr. R. Maag, Dielsdorf) slightly increased the yield of potatoes in late blight (*Phytophthora infestans*) spraying experiments but failed to equal 2 per cent. Bordeaux mixture in this respect. Notes are given on various other plant diseases observed during the period covered by the report.

MCRAE (W.). **Report of the Imperial Mycologist.**—*Scient. Repts. Imper. Inst. Agric. Res., Pusa, 1931–32*, pp. 122–140, 1933.

In inoculation tests at Pusa, India, *Cercospora dolichi* isolated from *Dolichos lablab* infected *Phaseolus aconitifolius*, *P. radiatus*, *P. mungo*, *Glycine hispida*, and *Vigna catjang* [*R.A.M.*, xi, pp. 130, 475]. Three years' observations showed that the fungus is virulent during February and March, when the local climatic conditions are comparable with its optimum growth conditions in the laboratory. In culture *C. dolichi* and *C. cruenta* (the latter obtained from *P. aconitifolius*) were quite different, two saltants from the parent culture of the former also differing from four saltants of the latter, but though the two species differed from one another morphologically and physiologically, each was able to infect the host of the other.

In March, 1931, to test the natural spread of sugar-cane mosaic a row of each of 25 mosaic-free varieties was planted alternately with a row of mosaic Co. 213; at cutting-time Co. 312 and Co. 313 showed, respectively, 4·4 and 16·5 per cent. mosaic. The experiment was repeated in 1932 with 34 healthy varieties, of which Co. 337, Co. 312, Co. 327, Co. 332, Saretha, and Co. 313 developed, respectively, 1, 1, 1·1, 1·3, 22, and 48 per cent. mosaic. A further

test showed that the mean sucrose percentage was 16·27 in healthy, and 15·60 in mosaic Co. 213 cane, a mean difference of 0·67 or 4 per cent. [ibid., xii, p. 192].

A comparison of all the species of *Helminthosporium* occurring on sugar-cane in Cuba [ibid., viii, p. 134], viz., *H. ocellum*, *H. stenospilum*, and the target blotch organism [ibid., x, p. 407] with *H. sacchari* and a highly sporing saltant (S. 8) derived from it but having larger, more septate spores, showed that on certain media they all differed in cultural characters such as intensity of sporulation, zonation, and amount and colour of aerial mycelium, whereas on others they appeared to be closely allied. This was particularly evident with *H. sacchari* and *H. ocellum*. In standard growth conditions the spore measurements were within the range of *H. sacchari* and its saltants. The size and septation of the spores of *H. stenospilum* and S. 8 were alike, while *H. sacchari* and *H. ocellum* are definitely considered to be identical with one another. Inoculations of a number of sugar-cane varieties, including Co. 213, Co. 316, and Red Mauritius, with these organisms gave positive results on all. The spots produced by the different organisms varied with the variety of cane, but it was almost impossible to distinguish the fungi by their spot characters, even the target blotch *Helminthosporium* failing to produce typical spots as described on any variety of cane tried.

A serious stem rot of *Hibiscus sabdariffa* at Pusa in January is attributed to a fungus resembling *Sclerotinia sclerotiorum*; it had an optimum growth temperature of about 22°, maximum below 33°, and thermal death point above 50°. On potato dextrose agar the *Botrytis* stage developed. *S. sclerotiorum* was also recorded on sunflower [ibid., xi, p. 652].

The percentage germination of the sclerotia of *Sclerotium oryzae* in rice stubble collected in March was 87 just after collection, 76 in October, and under 4 in the following January [ibid., xi, p. 600].

In further studies of the betel vine (*Piper betle*) disease associated with a *Phytophthora*, *Rhizoctonia* [*Corticium*] *solani*, and *Sclerotium rolfsii* [ibid., xii, p. 420] strains of the *Phytophthora* on this host from Bengal, Madras, Bombay, and Malaya, were compared in culture with various other species. Statistical analysis showed that sporangial length, width, and length-to-width ratio cannot be used as criteria for specific determination in this genus. Bordeaux mixture checked the *Phytophthora* [ibid., xi, p. 283] but was less effective with *C. solani*, which in some localities destroys numerous betel vines immediately after the rains and during cold weather. As kerol [loc. cit.] kills the mycelium of *C. solani* in the soil but not inside the undecayed stems, its use must be supplemented by improved sanitation. *S. rolfsii* appears so seldom on betel vine at Pusa that prevention has not yet been attempted.

Inoculations with the *Phytophthora* causing seedling blight of *Cinchona* [ibid., xi, p. 426] gave positive results on castor seedlings [*Ricinus communis*] but not on *Colocasia antiquorum* or betel vine, while the betel vine *Phytophthora* infected *Cinchona* as well as *R. communis*. In cultural characters the *Phytophthora* obtained from *Cinchona* agreed with *P. palmivora*, and like the latter, ceased growth at 35°.

A tobacco leaf spot of the shot hole type caused by an *Alternaria* did considerable damage on one farm in Bengal.

Every year at Pusa an *Alternaria* produces brownish spots with a pale yellow ring on wheat leaves, *Alternaria* spores being commonly present also on the seed coat; the leaf spot fungus was found to be parasitic on the leaves and capable also of causing foot rot.

In 1931–2, wheat infection by *Helminthosporium sativum* and *H. tritici-repentis* was less severe at Pusa than in the preceding year, but the variety P. 52 showed 17·3 per cent. leaf area destroyed, as against only 2·1 per cent. in 1930–1. Seed disinfection with uspulun-universal (0·25 per cent.) gave better control of *H. sativum* and *H. teres* than did formalin (1 in 320).

Forty-fifth Annual Report of the Kentucky Agricultural Experiment Station for the year 1932. Part I.— 75 pp., 1933.

The following, amongst other items of phytopathological interest, occur in this report. For the seventh consecutive year, tobacco mosaic was practically controlled at setting time on the Station farm by requiring the men to wash their hands before pulling the plants, and to chew manufactured plug instead of barn-cured tobacco, and by employing a non-user of tobacco for weeding [cf. *R.A.M.*, xii, p. 205]. At topping time one field thus safeguarded of 10,700 plants showed 0·54 per cent. mosaic and another of 9,454 plants, 4·75 per cent. The latter field had been under tobacco the previous year, when 2·7 per cent. mosaic was counted at cutting time, and the difference between the two fields suggests the transmission of infection through the soil in the second. When all the plants (about 900) on half a field under tobacco for 20 years were inoculated with mosaic in the autumn of 1930, and the stalks cut up and returned the following spring, 9·3 per cent. mosaic developed in the infested half and 3·4 per cent. in the uninfested. In the autumn of 1931, half the plants on the infested side were inoculated with yellow tobacco mosaic and the remainder with green [ibid., xi, p. 750], while all mosaic plants were removed from the other side of the field. The stalks of both yellow and green mosaic plants were cut up and returned to the infested half of the field before setting in 1932. At topping time, there was 1·8 per cent. mosaic on the uninfested and 16 per cent. on the infested side, both the yellow and green forms being represented. The former was observed nowhere else on the farm, indicating that it, like green mosaic, originated either from overwintering roots or from the stalks added to the soil. Green mosaic was about five times as prevalent as yellow. Greenhouse tobacco plants rubbed with mud from the infested half of the field and placed in infested soil contracted both types of mosaic in the late winter and spring of 1932. Infection was artificially induced on Turkish tobacco by rubbing the roots with, or dipping their cut ends into, a mosaic decoction, the incubation period for both green and yellow mosaic being 17 to 40 days.

Judging by the reports of 1,600 farmers on the No. 5 White Burley tobacco variety, this selection is characterized by an exceptionally high degree of resistance to root rot [*Thielaviopsis*

basicola: ibid., xii, p. 146]. Angular leaf spot (*Bacterium angulatum*) developed suddenly in plant beds of White Burley tobacco over an extensive area in the central bluegrass region. The disease was not prevented by double treatment of the seed with silver nitrate, but was completely controlled by one or two sprayings with Bordeaux mixture applied to the seedlings in a bed of 1,300 sq. ft., (1) during the development of the first true leaves, and (2) a fortnight later. *Bact. angulatum* was found to be killed by 10 minutes' exposure to a temperature of 52° C., suggesting that 20 minutes' seed treatment at this degree may be effective. Infection was rarely observed to occur through the upper leaf surfaces in foliage almost mature at the time of inoculation, whereas the very young leaves in an actively growing condition were equally liable to attack on either side. The largest spots were found to develop on the smallest, most tender leaves.

The ascospores of *Sclerotinia trifoliorum* infect red clover [*Trifolium pratense*] plants in the autumn directly through the leaves and petioles [ibid., xi, p. 461]. In a field containing numerous apothecia, the leaflets may be thickly peppered with small, brown spots whence the fungus can readily be isolated. *Sclerotium bataticola* [*Macrophomina phaseoli*] was isolated from red clover rootlets during the winter and summer, and from dead crowns of the same host in the greenhouse and field. The fungus proved mildly pathogenic to clover seedlings. Red clover plants growing next to tobacco affected by yellow ring spot [ibid., xii, p. 471] contracted a closely similar disease.

Botany.—*ex* Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1932.— *Missouri Agric. Exper. Stat. Bull.* 328, pp. 25–26, 1933.

The following items of phytopathological interest are contributed by C. M. Tucker. Loose smut of barley [*Ustilago nuda*] was entirely eliminated by X-ray radiation at a dosage of 3,840 *r*, but the treatment led to a serious decline of germination.

Surveys revealed the presence of flag smut of wheat [*Urocystis tritici*: ibid., ix, p. 167] only in three fields of the Red Wave variety in two counties.

Among the new or uncommon plant diseases reported in the State during 1931–2 were a pink mould of edible mushrooms caused by an undescribed species of *Diplocladium*; a canker of young *Albizzia julibrissin* branches due to *Nectria* sp.; a rot of pepper [*Capsicum annuum*] fruit (*Diaporthe* sp.); *Bacterium gummisudans* on gladiolus [ibid., viii, pp. 22, 382]; branch canker of magnolia (*Diplodia magnoliae*); leaf spot of lucerne (*Thyrospora sarcinaeforme*) [ibid., xi, p. 377]; and *Phytophthora parasitica* causing root rot of rhubarb [cf. ibid., xi, p. 331].

Report on the work of the Plant Protection Section during the period 1925–1931.— *Min. of Agric., Egypt*, 49 pp., 1 graph, 1933.

A short history is given of the work attempted and the results accomplished by the Plant Protection Section of the Egyptian

Ministry of Agriculture during the six-year period 1925–31. Reference to most of the work on fungal and bacterial diseases mentioned (on pp. 35–42) has been made from time to time in this *Review*.

OKABE (N.). **Bacterial diseases of plants occurring in Formosa III.**—*Journ. Soc. Trop. Agric.*, v, 2, pp. 157–166, 4 figs., 1933.

Continuing his investigations on the bacterial diseases of plants in Formosa [*R.A.M.*, xii, p. 554], the writer gives detailed descriptions of the leaf spots of jute (*Corchorus capsularis*) and soy-bean, caused by *Bacterium nakatae* type B and *Bact. sojae* var. *japonicum*, respectively, and of mulberry blight (*Bact. mori*) [ibid., xi, pp. 475, 756].

Bact. nakatae type B produces on jute leaves minute, water-soaked dots, gradually enlarging into translucent, brownish to blackish, irregular spots between the leaf veins, frequently surrounded by a pale yellowish-green halo, 1 to 2 mm. in diameter. The causal organism is a non-acid-fast, aerobic rod with rounded ends, measuring 1·1 to 2·5 by 0·3 to 0·4 μ, occurring singly, in pairs, or short chains, forming capsules on blood serum and potato dextrose agar, furnished with one polar flagellum and producing pseudozoögloeae in liquid media. On beef extract agar plates the colonies are round, smooth, glistening, pale yellow at first, deepening to brown; on slants the final colour is purplish-brown to deep brown. A brown colour is also developed at maturity on most other media. Gelatine is liquefied and milk coagulated; good growth is made in Uschinsky's but not in Cohn's or Fermi's solutions. Dextrose, saccharose, maltose, and lactose are utilized with acid production. Indol is not produced or nitrates reduced.

Fifteen minutes' exposure to sunlight resulted in the almost complete destruction of the cultures, which were also killed in two days in a desiccator. Good growth was made between P_H 5·9 and 7·6, with an optimum near 6·5. The minimum, optimum, and maximum temperatures for growth are 10°, 30° to 32°, and 39° C., respectively, with a thermal death point at 49°. Inoculation tests on jute seedlings with bacterial suspensions gave positive results.

This organism differs from *Bact. nakatae* Takimoto principally in its capacity to form a brown pigment in culture. This character is so distinct that the jute strain may conveniently be designated *Bact. nakatae* type B.

Bact. sojae var. *japonicum* was described (in Japanese) by S. Takimoto (*Journ. Plant Protect.*, xiv, p. 556, 1927) as causing angular or round, pale to blackish-brown spots with pale yellowish-green to mustard-yellow margins, 0·5 to 4 mm. in diameter, on the lower leaves of soy-beans, which finally become ragged owing to the breaking of the infected areas. The organism is a large rod with rounded ends, measuring 1·4 to 5·2 by 0·4 to 0·7 μ (average 2·6 by 0·5 μ) in beef extract agar, occurring singly, in pairs, or in chains and long filaments, motile by 1 to 4 polar flagella, forming glistening white colonies, not liquefying gelatine or coagulating milk, aerobic, Gram-negative, and non-acid-fast. Indol is not produced or nitrates reduced, but slight acid formation occurs in

saccharose and dextrose solutions of peptone water. Growth occurs in Uschinsky's and Fermi's solutions but not in Cohn's. The minimum, optimum, and maximum temperatures for growth are 3°, 25°, and 37°, respectively, with a thermal death point at 47°. Positive results were given by inoculation tests from a beef extract agar culture. A close relationship with *Bact. sojae* [ibid., xi, p. 316] is indicated.

The characters of the bacterium isolated from mulberry (*Morus alba*) blight agree with those of *Bact. mori*.

HAMDI (H.). **Über den sog. Pflanzenkrebs und seine Metastasen und ihre Vergleichung mit den Tiergewächsen.** [On the so-called plant cancer and its metastases and its comparison with animal growths.]—*Virchows Arch.*, cclxxxvii, 1, pp. 29–33, 3 figs., 1932.

For some years the writer has made experimental studies in Constantinople on the crown gall of plants caused by *Bacterium tumefaciens*, chiefly on *Pelargonium* [*zonale*]. In the beginning the gall is composed of an almost mosaic-like arrangement of young, polygonal cells and branched vascular elements, while at maturity it consists of a random distribution of cells and vessels differing from the normal tissues only in the large size of some of the elements.

The neoplasm develops (1) by cell proliferation consequent on the continual stimulus of *Bact. tumefaciens* and not by reason of any inherent capacity in the cells for multiplication; (2) by the abnormal multiplication of the healthy cells surrounding the site of infection; and (3) as a result of the penetration of the bacteria into the intercellular passages and vessels, whereby comparatively remote cells become exposed to the bacterial stimulus causing proliferation. In none of these modes of development is there any true analogy between plant and animal cancers, notwithstanding the superficial resemblances of destruction and extension common to both [*R.A.M.*, xi, p. 562].

The formation of the so-called metastases is effected by the upward migration of the bacteria from the point of inoculation coincident with the growth of the stem. When these detached bacteria remain close together, the resulting metastases often converge or are connected by a strand parallel with the cambium. In the youngest metastases the cells are arranged in arc-shaped rows round the centre of proliferation, otherwise they do not differ from the primary neoplasm, while at maturity the typical cauliflower shape may be assumed. The fairly common development of branches from a gall is attributable primarily to the bacterial stimulus on the cambium.

In metabolism and growth the plant gall is directly dependent on its host, suffering severely and partially disintegrating even with a slight reduction in the food supply and frequently healing spontaneously after three years, when the bacteria lose their virulence. The neoplasm is in no sense injurious to the plant as a whole and neither in its histological nor in its biological functions does it behave as an independent new formation.

IWAYAMA (S.). **On a new snow-rot disease of cereal plants caused by Pythium sp.**—Pamphlet issued by *Agric. Exper. Stat. Toyama-Ken, Japan*, 20 pp., 2 pl., 3 graphs, 1933. [Japanese, with English summary.]

In 1929 a new rot of cereals [species not indicated in the summary] under snow was detected in the Toyama prefecture, Japan. The disease, which is particularly injurious on early sown, heavily manured crops on poorly drained soils under a thick snow canopy, is attributed to a *Pythium*, believed to be probably a new species. The fungus grows well on potato and barley decoction agars, on which it is characterized by pale olive-yellow, granular hyphae, 2·9 to 8·9 μ in diameter (average 6·6 μ), becoming septate when mature; spherical, ellipsoid, oval, lemon-shaped, or irregular, thin-walled, smooth, pale olive-yellow, terminal sporangia, 28 to 48 by 26 to 44 μ on the host, 33 to 39 μ in diameter in culture; flask-shaped intercalary sporangia, 36 to 48 by 24 μ in diameter; spherical, terminal or intercalary oogonia, with a single spherical, pale olive-yellow oospore, 19 to 24 μ (21 μ) in diameter; and clavate antheridia arising from the same hypha as the oogonium or from another one. The optimum temperature for the growth of the fungus on culture media lies between 15° and 18° C. Inoculation experiments consistently gave positive results on cereal plants under snow.

ALLEN (RUTH F.). **Further cytological studies of heterothallism in Puccinia graminis.**—*Journ. Agric. Res.*, xlvii, 1, pp. 1–16, 6 pl., 1933.

After a brief reference to her previous communication on the development of *Puccinia graminis* in the leaf tissues of the European barberry [*R.A.M.*, xi, p. 168], the author gives a detailed account of her studies of the development and ulterior fate of the surface (receptive) hyphae. She found that in young, tender leaf tissue, the gametophytic hyphae push out freely between the epidermal cells to both the upper and lower surfaces of the leaf, and occasionally grow for short distances along the surface; in places where the epidermis is weakened by the tension exerted by the developing spermogonia, the surface hyphae are formed in great abundance. However, as the barberry leaves mature and their outer epidermal walls become thickened, the formation of new surface hyphae is rendered more difficult or prevented, and those that have already emerged between the epidermal cells die and disintegrate. In young infections, hyphae are rarely seen in the stomata (all of which are on the lower side of the barberry leaf), and those that are formed are rapidly killed by the closing of the stoma, but as the infection grows and the host tissues become hypertrophied, the stomata are easily opened and soon fill with hyphae in ever-increasing number.

Under the conditions of the experiments, fertilization of the aecidial primordia commonly occurred through the spermogonia on the upper surface, in some instances this being the only possible means observed for the entrance of the spermatia, which apparently fuse with the paraphyses. When fertilization was prevented, the spermogonia remained active during the whole life of the fungus;

they continued to extend and formed new paraphyses, and the drop of spermogonial exudate was maintained; but a day or two after fertilization, independently of the time at which it occurred, the formation of spermatia was stopped, the exudate dried up, and the spermogonia died. It is believed that fertilization can also take place through the stomatal hyphae on the lower leaf surface, although this was not actually seen. After its formation, the sporophyte spreads from its point of origin to the aecidial primordia. There was some evidence that this is effected in part by migration of nuclei through the existing hyphae.

MONTEMARTINI (L.). **Sopra la ruggine del Frumento in Sicilia.** [On Wheat rust in Sicily.]—*Atti R. Accad. di Sci., Lett. ed Arti, Palermo,* xviii, 16 pp., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 5–6, p. 256, 1933.]

In certain coastal areas of Sicily where the climate is marked by a hot, stagnant humidity, wheat is attacked almost every year by *Puccinia triticina* and to a less extent by *P. glumarum*, though in the interior of the island infection is much less frequent. *P. triticina* attacks every variety grown in Sicily, Rossello slightly, Majorca rather more, and Mentana (which on the mainland is considered to be resistant) very severely. There are two periods of greatest susceptibility, one when the ear, still covered by the leaf sheaths, first becomes differentiated, and the other when the grain is ripening.

RADULESCU (E.). **Beiträge zur Kenntnis der Feldresistenz des Weizens gegen Puccinia glumarum tritici.** [Contributions to the knowledge of the resistance of Wheat to *Puccinia glumarum tritici* in the field.]—*Planta*, xx, 2, pp. 244–286, 1 diag., 13 graphs, 1933.

A comprehensive and fully tabulated account is given of the writer's investigations at the Halle (Germany) Agricultural and Plant Breeding Institute on the factors influencing the resistance of wheat to yellow rust (*Puccinia glumarum tritici*) in the field.

The functional connexion between resistance and the slow opening of the stomata in the early hours of the morning suggested by Helen Hart [*R.A.M.*, ix, p. 295] was not confirmed in the writer's experiments, which showed that the rate of stomatal opening depended primarily on the amount of light accessible to the plants, the stomata of a given variety in shadow opening later than those of plants directly exposed to the sun. Stomatal movement was further shown to be influenced by manuring, nitrogen exerting a retarding action on the process while potash stimulates it. Of the 144 winter and summer wheat varieties and 87 progenies of crosses studied over a two-year period for their reaction to yellow rust, ten of the winter and four of the summer varieties proved uniformly resistant, viz., (1) Criewener 104, Fürst Hatzfeld, Hohenheimer 77, Krafft's Siegerländer, Krafft's Dickkopf, Kirsche's Stahl, Rimpau's Hybrid, Ridit, General v. Stocken, and Struy; (2) Grüne Dame, Hohenheimer 25 f., v. Rümker's Sommer-Dickkopf, and

Strube's roter Schlanstedter [cf. ibid., xii, p. 273]. These varieties, however, showed considerable discrepancies with regard to the rate and extent of stomatal opening, which were found to be heritable characters. Other varieties with a uniform rate of stomatal opening were resistant in one season and not in another, the variation from season to season being probably correlated with temperature differences. The writer's experiments do not indicate that stomatal behaviour alone can be used as a criterion of resistance to rust [ibid., xi, p. 439].

STEINER (H.). **Über die Braunrost- (Puccinia triticina und Puccinia dispersa) Anfälligkeit von reziproken Bastarden zwischen Weizen und Roggen.** [On the brown rust (*Puccinia triticina* and *Puccinia dispersa*) susceptibility of reciprocal hybrids between Wheat and Rye.]—*Der Züchter*, v, 2, pp. 179–180, 1933.

A seedling hybrid representing one variety of wheat (Bokhara) and four of rye (Heinrich, Hanna, Fischer, and Sturm) was inoculated in a glasshouse at the Vienna Institute of Agronomy with the uredospores of the wheat and rye brown rusts (*Puccinia triticina* and *P. dispersa* [*P. secalina*]), and proved to be susceptible to the former and resistant to, or immune from the latter. Similar results were obtained with the reciprocal rye-wheat hybrid.

YU (T. F.), CHEN (H. K.), & HWANG (L.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.)**—*Nanking Journ.*, iii, pp. 217–234, 1933.

A fully tabulated account is given of experiments conducted at Nanking, China, from 1925–32, inclusive, on the reaction to flag smut (*Urocystis tritici*) of a large number of native and foreign wheat varieties [*R.A.M.*, xii, p. 363]. The tests were made by shaking the seed-grain and spores together until thoroughly mixed and sowing at the ordinary time in the autumn. The control showed from 16 to 53 per cent. infection in different seasons from 1927 onwards. Of the 138 American varieties and strains (out of a total of 472 tested) that remained free from infection throughout the trials, special promise as regards adaptability to local conditions was shown by three, viz., Red Rock, Mindum, and Quality. The most satisfactory of the 13 German varieties was Carstens Squarehead (free from smut for seven years). Of the four Canadian varieties, Dawson's Golden Chaff and Marquis maintained freedom from infection for five years, during which period only two of the 21 Australian varieties (Nebawa and Rajah) remained immune from the disease. Only one of the 136 Chinese wheats used in the tests showed no smut during the whole period, namely, Nanking No. 16, but three collections, Kaifeng 22 and 52 and N. 590 showed a low percentage of infection in the first year only.

It is apparent from these data that, in general, foreign wheat varieties, though later maturing, are more resistant to flag smut than those indigenous to China.

MUNERATI (O.). **È possibile separare delle comuni varietà di Grano razze o linee resistenti alla carie?** [Is it possible to isolate in common Wheat varieties, races, or lines resistant to bunt?]—*Italia Agric.*, pp. 25–27, 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 5–6, pp. 273–274, 1933.]

From artificial infection experiments conducted over a period of three years with seed from 2,800 Gentil rosso and an equal number of Ardito wheat plants which the year before had remained unaffected by bunt [*Tilletia caries* and *T. foetens*] the author concludes that neither variety contains lines or races resistant to the disease.

BRIGGS (F. N.). **A third genetic factor for resistance to bunt, Tilletia tritici, in Wheat hybrids.**—*Journ. of Genetics*, xxvii, 3, pp. 435–441, 3 graphs, 1933.

The detection of a factor for resistance to wheat bunt (*Tilletia tritici*) [*T. caries*] in Turkey wheat in California, the genetical evidence for which is given in this paper [*R.A.M.*, xi, p. 500], adds a third to the Martin and Hussar factors previously investigated [ibid., xii, pp. 84, 155]. The new Turkey factor approximates to Hussar in its relative dominance, as compared with the absolute dominance of Martin, bunt in the two former varieties developing on about half or less of the heterozygous plants. The three factors under observation should serve to differentiate eight physiologic forms of *T. caries* [cf. ibid., xii, p. 617]. J. G. Churchward has found that the resistance to bunt of Florence wheat in New South Wales is due to a single recessive factor [ibid., xii, p. 85], which must be distinct from the three mentioned above.

STIELTJES (D.). **Dilophospora-ziekte van granen en grassen.** [The *Dilophospora* disease of grains and grasses.]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 200–206, 3 pl., 1933.

Following the observation in 1931 and 1932 of an attack on oat crops by *Dilophospora graminis* [*D. alopecuri*: *R.A.M.*, xi, p. 767] in the absence of eelworms (*Tylenchus tritici*), the author sowed rye, wheat, oats, and some twenty grasses on an affected plot, the seed-grain being mixed with a few diseased oat grains. Oats in the experimental plot contracted infection by *D. alopecuri* to a varying extent, rye was very slightly attacked, and wheat remained completely immune. Infection was also observed on *Avena elatior*, *Holcus lanatus*, and *Agrostis spica-venti*. No trace of *T. tritici* was found in the infected plants.

In oats, the upper part of the plant becomes abnormally thick and the plume, enveloped by the sheath of the last leaf, cannot free itself from the sheath of the penultimate leaf. Between these two leaf sheaths, and between the last leaf and the plume is a white mass of mycelium which surrounds and destroys the flowers. Later, both leaves and leaf sheaths develop well-defined, yellowish-white spots, while in some cases the whole of the last leaf may turn yellowish-white with a dry, dead tip which is caught within the next leaf sheath. The pycnidia of the fungus develop in immense numbers on the lesions. In milder attacks the plume

succeeds in partially rupturing the enclosing leaf sheath, the basal portion, however, generally being killed and disintegrating into a brownish-black mass. On breaking open the leaf sheath of a diseased plant left for some little time in a damp atmosphere, the remnants of the glumes may generally be discerned, but the site of the flowers is occupied by a thick, felt-like mass of hyphae, already beginning to turn brown.

In the above-mentioned susceptible grasses the symptoms are as described for oats, but in rye the ear usually develops normally except in very severe cases, when it remains enveloped in the uppermost leaf sheath. Affected rye plants remain abnormally short owing to the stunting of the top node.

This is believed to be the first record of *D. alopecuri* on oats, the spore measurements on which agree entirely with those given by Atanasoff. The spread of the disease in the Meppel district of Holland, where these observations were made, is, no doubt, due, as in Germany [ibid., viii, p. 300], to the use of infected seed. The resistance of wheat and various grasses to the local strain of the fungus seems to point to the existence of biologic forms of *D. alopecuri*.

BOCKMANN (H.). **Die Schwärzepilze des Getreides unter besonderer Berücksichtigung ihrer Pathogenität und des Vorkommens von Rassen innerhalb der Gattungen Cladosporium Link und Alternaria Nees.** [The blackening fungi of cereals with special reference to their pathogenicity and the occurrence of strains within the genera *Cladosporium* Link and *Alternaria* Nees.]—*Angew. Bot.*, xv, 3, pp. 308–321; 4, pp. 329–385, 9 figs., 2 graphs, 1933.

The so-called 'blackening' disease of cereals, characterized by an overgrowth with olive-green to black mycelia of various fungi on any of the plant organs, was studied on cereal specimens collected in Schleswig-Holstein during 1930–1 and infected by different strains of *Cladosporium herbarum* (wheat, spelt, rye, barley, and oats), *Alternaria tenuis* (wheat and oats), *A. peglionii* [*R.A.M.*, v, p. 663] (wheat, oats, rye, and barley), and *A. circinans* [see above, p. 3].

The cultural and morphological characters of representative strains of *C. herbarum* are described. The conidiophores of the *Cladosporium* forms differed widely from those of the *Hormodendrum* type, to which some of the strains approximated [ibid., vii, p. 709]. In the former, the number of conidia formed by a conidiophore did not exceed 50, whereas in those of *Hormodendrum* 200 to 300 may be found. The minimum conidial length of four *Cladosporium* strains (mean of 200) was $8{\cdot}99 \pm 0{\cdot}23014\ \mu$ and the maximum $9{\cdot}45 \pm 0{\cdot}20581\ \mu$, the corresponding dimensions for four *Hormodendrum* strains being $5{\cdot}46 \pm 0{\cdot}15135\ \mu$ and $6{\cdot}58 \pm 0{\cdot}26089\ \mu$, respectively; the minimum and maximum widths for the former group were $4{\cdot}63 \pm 0{\cdot}07307\ \mu$ and $4{\cdot}83 \pm 0{\cdot}070097\ \mu$, and for the latter $2{\cdot}98 \pm 0{\cdot}042989\ \mu$ and $3{\cdot}14 \pm 0{\cdot}04028\ \mu$.

On the particularly favourable maltyl-liebig-agar medium it was possible to classify all the strains according to their colour, which was greyish-green in the case of *C. herbarum* and yellowish-green

in that of *H. cladosporioides*. A comparison of the growth rates of several strains on potassium and ammonium salts indicated that the former tend to stimulate and the latter to depress growth. Two *Cladosporium* and three *Hormodendrum* strains made good growth at P_H 5·6, 6·4, 7·2, and 8·0, with a tendency to more vigorous development towards the alkaline side. The optimum temperature for growth was found to be 26° C., with a minimum at –2° and maximum at 33°. The *Hormodendrum* strains were much more active in the decomposition of albumin than those of *Cladosporium*. Seven strains of the latter dissolved starch and disintegrated pectin.

Discussing the problem of polymorphism in *C. herbarum* and *H. cladosporioides*, the writer finds no evidence for its existence in the sense of alternating development of the two spore forms. The development of *Hormodendrum* sectors in *Cladosporium* colonies, occasionally observed by him, is not regarded as an indication of polymorphism, being equally well explicable as a vegetative modification. The differences between the *Cladosporium* and *Hormodendrum* groups scarcely justify the establishment of two distinct species. For the present *C. herbarum* should rank as a collective species.

The *Alternaria* strains were investigated on the same lines as *C. herbarum*. On maltyl-liebig-agar the mean conidial dimensions of *A. tenuis* (from oats) were found to be 28·37 ± 0·51399 by 10·34 ± 0·14182 μ, for *A. peglionii* (barley) 24·69 ± 0·47838 by 11·08 ± 0·14304 μ, and for *A. circinans* (wheat) 40·78 ± 1·1187 by 12·20 ± 0·17116 μ. The conidia of *A. peglionii* are light brown and of very irregular shape, sometimes markedly piriform with an elongated isthmus joining two spores. *A. tenuis* is characterized by olive-green to brown conidia of regular form with a very short but well-defined isthmus. In *A. circinans* the conidia are olive-green to brown, elongated, and pluriseptate. Potassium and ammonium salts affected growth in the same way as with *C. herbarum*. The optimum temperature for development was found to be 26°.

The writer has never detected the blackening fungi in the field except on tissues already destroyed by other agencies. Inoculation experiments with *C. herbarum* on wheat seed-grain definitely showed that this fungus is not concerned in the black discoloration of foot-rotted plants. Tests with various strains of the same fungus on wounded and unwounded wheat, barley, oats, and rye leaves gave consistently negative results, even at low temperatures (1° to 5°). In order to determine the part played by *C. herbarum* in the development of the disorder known as 'black point' in the United States, 'puntatura' in Italy, 'mouchetage' [or 'moucheture'] in France [ibid., x, p. 21], and 'dark' or 'brown tip' in Germany (*Landw. Jahrb.*, xxiii, p. 969, 1894), the writer inoculated a strain of the fungus into milk-ripe wheat and barley seeds (40 of each) in Petri dishes. Infection was contracted by 37 wheat and 20 barley seeds, the mycelium penetrating the pericarp and spreading from cell to cell through the pits. The endosperm and embryo were not invaded and there was no brown discoloration of the tissue as in black point, so that *C. herbarum* can scarcely be

considered as a cause of this trouble. This fungus indeed seems only able to grow in dead tissues and is evidently a saprophyte in Münch's sense [*R.A.M.*, ix, p. 47].

Similar inoculation experiments with *A. peglionii* (17 strains) failed to cause foot rot of wheat, but local discolorations developed where the hyphae had attempted to enter the cells, their progress being checked by a cellulose sheath [ibid., iii, p. 82; xi, p. 708]. *A. tenuis* was found to be capable of the active destruction of living leaf tissue of all four cereals, but produces only microscopic symptoms, and must therefore be regarded as a true perthophyte. Barley and oats are more susceptible than wheat and rye. Neither *A. tenuis* nor *A. peglionii* succeeded in penetrating the testa of wheat and barley seeds, though in a few cases the presence of a cellulose sheath indicated attempted entry. The rôle of these fungi in the etiology of black point is similar to that of *C. herbarum*. The blackening fungi are of little economic importance except as tending to lower the market value of the seed-grain.

SCHMIDT (E. W.) & FEISTRITZER (W.). **Beiträge zur Fusskrankheit des Getreides und ihrer Bekämpfung.** [Contributions to the foot rot of cereals and its control.]—*Arch. für Pflanzenbau*, A, x, 3, pp. 391–421, 1 diag., 1 graph, 1933.

In this further account of investigations at Kleinwanzleben, Germany, on the foot rot of cereals predominantly associated with *Fusarium culmorum* [*R.A.M.*, xii, p. 157], the writers again note the beneficial effects on barley and wheat of ploughing under the stubble to a depth of 24, or preferably 34 cm. In a test with winter wheat it was found that late sowing (mid-November to early December) reduced the incidence of infection, but under such conditions tillering and ear weight simultaneously declined, especially in Rimpau's Hybrid, necessitating the use of larger quantities of seed-grain. No intensification of infection resulted from the ploughing under of diseased stubble. The amount of foot rot was increased by applications of stable manure (200 doppelzentner per hect.) and *F. culmorum* was isolated from the manure heaps. The disease was less severe in stands sprayed with sulphuric acid at the rate of 20·6 doppelzentner per hect., but spring applications of kaolin (40, 100, or 400 gm. per sq. m.) proved ineffectual.

F. culmorum was found to occur in a viable condition in the soil to a depth of 50 cm.

TANJA (ANNA E.). **Untersuchungen über Gibberella saubinetii (Dur. et Mont.) Sacc. und die Fusariose des Weizens.** [Investigations on *Gibberella saubinetii* (Dur. et Mont.) Sacc. and the fusariosis of Wheat.]—*Phytopath. Zeitschr.*, vi, 4, pp. 375–428, 1 fig., 5 diags., 21 graphs, 1933.

The hydrogen-ion concentration of a modified Richards's solution was changed from P_H 4·05 and P_H 6·06 to a point beyond neutrality in two instances by the growth of three strains of *Gibberella saubinetii* from the Centraalbureau voor Schimmelcultures, originally isolated by Wollenweber, F. T. Bennett [*R.A.M.*, x, p. 783], and Harter. At P_H 2·8 the growth of the strains was poor, at 4·05 the optimum (expressed in terms of dry weight) was

reached, with a gradual decline at 6·06 and a very small growth at 7·02. The minimum temperature for the development of the three strains of *G. saubinetii* was just below 6° C., that for *Fusarium culmorum* [ibid., xii, p. 502] being 9°. Bennett's strain of *G. saubinetii* developed best at 30°, Wollenweber's and *F. culmorum* at 27°, while the range of Harter's strain was fairly wide (21° to 30°); the maximum for all four lay round about 36° [cf. ibid., xii, p. 621].

The germinative capacity of two wheat varieties, the Swiss Plantahof and the American Marquis (both supplied by the Federal Agricultural Experiment Station, Oerlikon-Zürich), was determined at varying temperatures. The optimum (98 per cent.) for Plantahof was found to be 18° with a fairly satisfactory germination percentage between 6° and 35°. Marquis germinated best (92 per cent.) at 15° with a rapid decline in the number of seedlings at both higher and lower temperatures. Both varieties suffer more severely from *G. saubinetii* and *F. culmorum* at high than at low temperatures, the attacks of the former being particularly virulent under dry conditions. Plantahof showed a higher degree of resistance to *G. saubinetii* and *F. culmorum* than did Marquis. Bennett's strain of *G. saubinetii* was the most virulent of the three tested and Harter's the least, Wollenweber's and *F. culmorum* being intermediate.

A three-page bibliography is appended.

HEWLETT (C. H.) & HEWLETT (M. A.). **Hot-water treatment of seed Barley.**—*New Zealand Journ. of Agric.*, xlvii, 1, pp. 33–37, 1933.

In 1933, twenty-six growers in the Canterbury district of New Zealand again persisted in using their own barley seed instead of the pure strains free from smut [*Ustilago hordei* and *U. nuda*: *R.A.M.*, xi, pp. 505, 776] available to them. The result was that while the product of the treated seed was 38·9, 23·2, and 37·9 per cent. grades 1, 2, and 3, respectively, the corresponding figures for that of the untreated seed were 26·6, 28·5, and 44·9 per cent.

The average yield obtained from the grower's own seed was no less than 5·2 bushels per acre less than that from the treated seed, the total reduction in yield and grade representing a value of 17*s.* 8*d.* per acre, or £1 1*s.* 9*d.* per acre if the 'mill seconds' are included.

YU (T. F.) & CHEN (H. K.). **Seed treatments for controlling stripe disease of hulless Barley.**—*Nanking Journ.*, iii, pp. 237–242, 1933.

Further experiments (1927–9) in the control of barley stripe [*Helminthosporium gramineum*] in the Nanking district of China [*R.A.M.*, ix, p. 29] showed that none of the dusts tested (copper carbonate, uspulun, tillantin, and tillantin B) was fully effective against this disease, though all reduced its incidence. Used in liquid form, uspulun and tillantin (0·3 per cent., one or two hours' immersion of the seed-grain) gave better control than the dusts and in some cases entirely eliminated infection.

YU (T. F.) & CHEN (H. K.). **Treatment of hulless Oat to prevent covered smut [Ustilago levis (Kell. & Sw.) Magn.]**—*Nanking Journ.*, iii, pp. 235–236, 1933.

The results of two years' experiments at Nanking, China, demonstrated the efficacy of copper carbonate and tillantin B dusts (4 oz. per bushel) in the control of covered smut of hull-less oats (*Ustilago levis* [*U. kolleri*]).

FAWCETT (H. S.). **New locations for Phytophthora citrophthora and P. hibernalis on Citrus.**—*Phytopath.*, xxiii, 8, pp. 667–669, 1933.

Phytophthora citrophthora was isolated from decayed oranges and grapefruit in Florida, and from the former host in Louisiana in 1932, while *P. parasitica* was found on oranges in Florida [*R.A.M.*, xii, pp. 368, 565], the determinations being confirmed by S. F. Ashby. This appears to be the first record of the occurrence of *P. citrophthora* in Florida, where *P. parasitica* was previously known on grapefruit. *P. hibernalis* [ibid., xii, p. 212] (also identified by S. F. Ashby) was isolated from rotting oranges in California in 1932, this being apparently the first definite record of the fungus in the United States. The writer is now of opinion, however, that an organism isolated in previous years from Californian citrus fruits was actually *P. hibernalis*, the extreme intolerance of which to the high temperatures prevailing in the late spring and summer has hitherto tended to prevent its investigation. Recently Ashby has determined a species isolated from citrus roots in California as probably *P. megasperma* [ibid., xi, p. 303].

[NATTRASS (R. M.).] **Gummosis of Citrus trees.**—*Cyprus Agric. Journ.*, xxviii, 2, pp. 49–52, 2 figs., 1933.

After stating that in most of the old-established citrus groves in Cyprus gummosis [*Phytophthora citrophthora*: *R.A.M.*, xii, p. 368] of the main root, collar, and trunk is favoured by the use of the old basin system of irrigation, which leaves the tree in a standing pool of water, the author indicates a method (for use when the furrow system of irrigation between the rows is impracticable) of remedying this by laying bare the roots for about 2 ft. and making a parapet of the earth removed in the process between the trunk and the basin.

Of the citrus varieties locally grown the lemon is the most susceptible, followed by sweet lime (*Citrus aurantifolia*), hitherto commonly used as a stock. With the distribution of resistant bitter orange (*C. aurantium*) [var. *bigaradia*] stock by the Horticultural Department little trouble from gummosis is to be expected in the new groves. As, however, the ordinary Jaffa orange scion is also susceptible the union should not be made nearer than 8 in. to the ground, and young trees budded in nursery beds should be planted no deeper in the groves than in the nursery.

Notes are given on the treatment of affected trees by surgical methods, 'inarching' (i.e., planting resistant stocks round the tree,

the tops being grafted into the trunk above the injury), and 'bridge grafting' when the base of the scion has become infected.

WINSTON (J. H.). **Some factors influencing decay in Florida Citrus fruits.**—*Citrus Industry*, xiv, 5, pp. 20, 24, 1933. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 3, p. 136, 1933.]

Citrus fruits in Florida are stated to be specially liable to decay by two stem-end rots [*Diplodia natalensis* and *Diaporthe citri*: *R.A.M.*, xi, p. 771; xii, pp. 213, 495]. The factors contributing to this form of decay are discussed under two headings, viz., pre-harvest, and harvesting and post-harvest. Dead wood in the trees is the sole known source of infection by *Diplodia*. Contrary to popular belief, early harvested fruit decays much more slowly than that picked later. Fruit sprayed with the less volatile types of oil within a month of picking requires a longer time in the colouring room, whereby the amount of decay is increased. Fruit from trees to which ammoniate fertilizers are applied in excess readily bruises and decays. Fruit on rough lemon rootstocks is particularly susceptible to stem-end rots. The factors promoting infection at and after harvest include careless dipping; over-filling field boxes; failure to use borax in the washing operations, when it is much more effective against stem-end rots than after colouring [cf. ibid., viii, p. 378]; faulty handling in the colouring room; and delay between picking and pre-cooling.

LINDERMAN (R. H.). **A spray programme for Citrus trees.**—*Citrus Industry*, xiv, 5, p. 6, 1933. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 3, p. 137, 1933.]

In addition to its insecticidal efficacy, the spraying schedule in force at Mountain Lake, Florida, is claimed to have reduced the incidence of melanose [*Diaporthe citri*: see preceding abstract] below the degree prevalent in neighbouring orchards while improving the colour and texture of the fruits. A first application of lime-sulphur is given in mid-January (1:25 for grapefruit and 1:40 for oranges) and is further stated to effect considerable control of scab [*Sporotrichum citri*]. Dry lime-sulphur may also be used, 2 lb. equalling 1 gall. of solution. The second application (1:40) is made when three-quarters of the blossom has fallen, followed by treatments at the same strength every seven weeks until 1st September, after which one more application suffices to maintain the fruit in good condition until the harvest. A spray pressure of 400 to 500 lb. is used.

L'anthracnose des Aurantiacées Colletotrichum gloeosporioides Penz. (Deuteromycetae, Melanconiae). [Anthracnose of Aurantiaceae, *Colletotrichum gloeosporioides* Penz. (Deuteromycetae, Melanconiae).]—*Direct. Gén. Agric., Comm. et Colon., Service Défense Véget., Mém.* 12, 6 pp., 1 pl., 1933.

Notes are given in popular terms on the symptoms, etiology, and control of citrus anthracnose (*Colletotrichum gloeosporioides*) in Morocco.

BARGER (W. R.). **Water-glass helps to control mold of Oranges.**—*California Citrograph*, xviii, 9, pp. 240, 256, 3 graphs, 1933.

In tests conducted in California in 1927–8 Valencia and Navel oranges, on some of which various types of commonly experienced surface injury had been experimentally reproduced, were dipped into water containing oranges affected with mould [*Penicillium digitatum* and *P. italicum*], allowed to dry, and then immersed for 4 minutes in a 4 to 5 per cent. solution of sodium borates in water or in a 2 to 6 per cent. solution of concentrated water-glass (sodium silicate) stock solution in water, each held at 100° F. and containing a suspension of the spores; control fruits, some of which were also experimentally injured, were similarly inoculated and placed in water at 100° for 3 minutes. The fruit was then dried, wrapped, boxed, and stored at room temperature under a tarpaulin.

Two weeks after treatment the average amounts of decay induced by all the types of injury on the Valencia oranges were about 58, 66, and 90 per cent., for the water-glass, borax, and control treatments, respectively, the corresponding figures for the Navel oranges being about 86, 82, and 96 per cent.; four weeks after treatment the decay figures for the Valencias were about 76, 84, and 97 per cent., respectively, while three weeks after treatment those for the Navel oranges were about 93, 90, and 99 per cent. With fruit not experimentally injured the water-glass treatment, though giving less effective control than borax, reduced decay by nearly one-half for two weeks after treatment and by one-quarter to one-third during a period of four weeks after treatment.

Miscellaneous decay caused mainly by *Colletotrichum* and *Alternaria* was not reduced by either treatment.

On the experimentally injured, borax-treated fruit *P. digitatum* was almost completely controlled, though deep-seated infection by this fungus before picking may not be reached by the solution. Decay following treatment by water-glass was due almost entirely to *P. digitatum*.

In other tests with Navel oranges a 2 per cent. solution of water-glass gave better results than stronger ones.

Over 80 per cent. of the decay in the experimentally injured fruits developed within two weeks of picking and treating, whereas only 30 to 60 per cent. of the decay in the fruit with only old natural injuries developed in the same period. This demonstrates the need of care in picking and handling fruit even when it is to be treated.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Preliminary observations on the storage of Limes, with a note on the King Orange.**—*Trop. Agriculture*, x, 7, pp. 190–191, 1933.

In preliminary storage trials [which are described] at the Low Temperature Station, Trinidad, unwrapped, relatively immature or slightly yellow West Indian limes [*Citrus aurantifolia*] kept at 45° F. for 20 days developed only 4 per cent. fungal wastage, all due to *Penicillium italicum*. Eighty-eight per cent. of the fruits were sound, and eight per cent. were rejected because of external desiccation. It is concluded that the West Indian lime, if carefully

wrapped and suitably crated, possesses good keeping qualities when held at 45°.

Severe tests with the King orange or giant mandarin (a variety of *C. nobilis*) demonstrated that no difficulty need be anticipated in the refrigerated transport and storage of this attractive-looking fruit, provided it is picked when fully grown but still green or only slightly coloured at the stylar end.

STAHEL (G.). **Zur Kenntnis der Siebröhrenkrankheit (Phloëmnekrose) des Kaffeebaumes in Surinam. III.** [Contribution to the knowledge of the sieve-tube disease (phloem necrosis) of the Coffee tree in Surinam. III.]—*Phytopath. Zeitschr.*, vi, 4, pp. 335–357, 12 figs., 1933.

The writer's and H. G. Bünzli's descriptions of the external symptoms of phloem necrosis of coffee trees in Surinam [*R.A.M.*, xii, p. 435] are briefly recapitulated, and full details are given of a further series of inoculation experiments conducted in 1932.

A 28-year-old Liberian coffee tree showed in the soft bast of the root eight rows of sieve-tubes that had undergone multiple division, of which the three outermost were necrotic, while the next two were still living and full of minute flagellates (*Phytomonas leptovasorum*), none of which could be found in the three youngest rows. The whole tree was dug out and the root material (in pieces about 20 cm. in length) used for grafting on the roots of twelve healthy eight-year-old trees, in close proximity to which ten other trees were similarly treated with healthy roots. Six months after grafting all the trees to which diseased material was applied showed definite external symptoms of phloem necrosis and all died a few months later, whereas the ten controls remained healthy. Before the symptoms were obvious 23 twelve-year-old healthy trees were similarly treated with roots from the previously inoculated plants, and of these, nine contracted the disease.

On 30th December, 1930, necrotic root material was grafted on to a twelve-year-old tree, roots from which were grafted in the following May on to two neighbouring trees, with positive results in one case. In July roots from the last-named were applied to three more trees, two of which contracted phloem necrosis. The roots of one of these trees were grafted in October on to two 28-year-old trees, both of which developed the disease in an acute form.

Negative results were given by the transplantation of fragments of the root and stem cortex from diseased to healthy trees, and also by grafting on the latter, portions of branches, 1½ to 2 cm. thick, known to contain flagellates. The examination of the branches used for grafting showed that the flagellates rapidly disappear after the branch is cut, whether the graft takes or not.

All attempts to culture *P. leptovasorum* have hitherto been unsuccessful.

Detailed observations on the dissemination of the flagellates in the soft bast of a number of infected trees revealed important differences between the chronic and the acute forms of phloem necrosis. In the former type the sieve-tubes occupied by the flagellates may function for weeks after invasion, so that the

metabolic products of the protozoa can gradually permeate the entire tree and the symptoms may be, in part, due to a toxic action of these. Food transport is apparently possible even after the multiple division of the sieve-tubes. In acute attacks the flagellates penetrate the sieve-tubes in great numbers and rapidly spread through the root system to the stem, covering apparently a distance of up to 240 cm. within a fortnight. In the stem the sieve-tubes are killed and the phloem parenchyma forms hypertrophied or callus-like tissue in which the groups of collapsed sieve-tubes are embedded. The cambium becomes inactivated and the food-transporting mechanism is destroyed. In such cases the slender rootlets soon die of starvation, and with the onset of dry weather rapid wilting takes place.

MÉTALNIKOV (S. S.). **Action des rayons solaires sur les spores de bactéries pathogènes pour les insectes.** [The action of solar rays on the spores of bacteria pathogenic to insects.]—*Comptes rendus Soc. de Biol.*, cxii, 16, pp. 1666–1669, 1933.

Experiments were carried out in Egypt in 1932 to determine the resistance of certain bacteria of proved pathogenicity to the pink boll worm of cotton (*Gelechia gossypiella*) to the solar rays (1) in June with minimum, mean, and maximum temperatures of 14°, 27°, and 56° C., and (2) towards the end of the summer (18°, 23°, and 40°, respectively). The organisms used were *Bacterium* Cazaubon (isolated in 1930 from the caterpillars of *Pyrausta nubilalis*) [cf. *R.A.M.*, viii, p. 309] and *Bact. ephestiae* No. 1 (isolated in 1931 in Egypt during an epizootic of *Ephestia kuehniella*). The ground cultures (100 mg. of each organism) were exposed to the sun's rays in Petri dishes for periods of 4 or 10 days in the early tests and 6 and 20 days in the late ones, after which bacterial emulsions were prepared, partly for injection into the boll worms and the rest for spraying on cotton, on which 10 to 15 caterpillars were placed after 15 minutes and allowed to feed.

In the June experiments the periods required for the Cazaubon organism to kill the boll worms by injection after 4 and 10 hours' exposure to the sun's rays were 5 and 14 hours, respectively, compared with 3 hours for the unilluminated controls. Applied *per os*, the bacterium destroyed 9 out of 10 insects in 20½ and 23 hours after 4 and 10 hours' radiation, respectively, compared with 18 hours for the untreated controls. *Bact. ephestiae* No. 1 destroyed the boll worms by injection in 3 and 8 hours, respectively, after 4 and 10 hours' exposure to the sun, compared with 2 hours for the control, the corresponding times for oral administration being 9, 27, and 7 hours, respectively. In the late summer (20th September to 10th October) tests, the Cazaubon organism killed the controls in 4 hours after injection, compared with 6 to 9 hours 35 minutes after various periods of exposure to the sun, the respective periods when applied *per os* being 18 and 18 to 26 hours.

It is apparent from these data that the spores of the bacteria Cazaubon and *ephestiae* No. 1 undergo only a very slight diminution of their vitality and virulence even after comparatively lengthy exposures to the solar rays.

MÉTALNIKOV (S.) & MÉTALNIKOV (S. S.). **Utilisation des bactéries dans la lutte contre les insectes nuisibles aux Cotonniers.** [The utilization of bacteria in the campaign against insect pests of Cotton.]—*Comptes rendus Soc. de Biol.*, cxiii, 18, pp. 169–172, 1933.

As a sequel to the laboratory tests with three bacterial organisms pathogenic to the pink boll worm of cotton (*Gelechia gossypiella*), viz., *Bacterium* Cazaubon, *Bact. ephestiae*, and *Bact. gelechiae* No. 5 [see preceding abstract], the writers conducted a series of field experiments at Gizeh, near Cairo, on 42 plots each measuring 22·5 sq. m. and containing some 250 plants, over which a bacterial emulsion (2·5 to 10 gm. per l. with 4 per cent. molasses) was sprayed twice to four times at regular intervals from the first appearance of the insects.

The best results were secured with *Bact. ephestiae*, which reduced the incidence of infestation by 50 per cent. (average of four plots), while the Cazaubon organism was almost equally effective in two plots. *Bact. gelechiae* was less efficacious (as in the laboratory tests), with a reduction of infestation amounting to under 40 per cent. in two plots. The spread of the bacteria outside the limits of the treated areas was shown by the low degree of infestation in the fields adjoining the experimental plots.

Considering the great technical difficulties of the treatment and the excessively heavy infestation in the control plots (nearly 7 boll worm caterpillars per capsule on an average), these results may be regarded as decidedly encouraging, especially as the average reduction in four plots treated with an arsenical solution was only 18 per cent.

SMITH (L. M.). **Coccidioidal granuloma. Report of a case originating in western Texas.**—*Arch. of Dermatol.*, xxviii, 2, pp. 175–181, 5 figs., 1933.

A report is given of a case of human coccidioidal granuloma, in which *Coccidioides immitis* [*R.A.M.*, xii, p. 692] was found in Texas, where the disease was not previously known. The low degree of contagion in the disease is explained by the rapid death of the spores (within five minutes) on drying.

MOCCHI (G.). **Un nuovo caso di haplografiosi.** [A new case of haplographiosis.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 63–67, 2 figs., 1933. [Latin summary.]

In giving a few clinical notes on a case of ulceration of the skin on the face of a man, observed in 1931 in Pavia, the author states that cultural studies of the organism isolated from the lesion showed it to be *Haplographium de bellae-marengoi* [cf. *R.A.M.*, iii, p. 290], giving further evidence of the pathogenicity to man of this fungus. The lesion did not yield to any of the treatments tested, unlike previous experience with similar cases.

VERONA (O.). **Sul marciume del colletto dei Garofani.** [On basal rot of Carnations.]—*Boll. R. Ist. Sup. Agr. di Pisa*, viii, pp. 451–455, 1932.

Carnations at Pescia affected with basal rot showed the presence

of *Fusarium herbarum*, and inoculations with pure cultures isolated from the plants reproduced the disease, which has hitherto been attributed to *F. dianthi* [*R.A.M.*, viii, p. 788; x, p. 245].

Control consists in replanting and soil disinfection with formaldehyde solution (1 in 300) applied at the rate of 10 to 12 l. per sq. m. As a preventive, a dust composed of iron sulphate and quicklime in equal parts may be applied to the foot of healthy or very slightly affected plants.

HARRIS (M. R.). **A Phytophthora disease of Snapdragons.**—*Science*, N.S., lxxviii, 2016, p. 152, 1933.

Phytophthora (?) *cactorum*, isolated in 1932 from wilted greenhouse snapdragons [*Antirrhinum majus*] in California, was shown by inoculation experiments with pure cultures on maize meal to be pathogenic to the plants. Spontaneous infection was characterized by extensive decay of the cortical tissues of the stem base and larger roots; the yellow or brown lesions at or below soil level became sunken and were liable to be sloughed off, and the growing part of the stalk killed. Some 50 per cent. of the plants were destroyed or rendered valueless, the resultant financial loss amounting to several thousand dollars. Infection was traced to the water supply and compost soil, the sterilization of which completely prevented wilting. A yellow bacterium and *Cephalosporium acremonium*, isolated simultaneously with the *Phytophthora*, were non-pathogenic.

ALCOCK (Mrs. N. L.). **Downy mildew of Meconopsis.**—*New Flora and Silva*, v, 4, pp. 279–282, 1 pl., 1 fig., 1933.

A semi-popular account is given of the downy mildew of *Meconopsis betonicifolia*, *M. wallichii*, *M. integrifolia*, *M. regia*, and other species, caused by *Peronospora arborescens* [*R.A.M.*, viii, p. 576], the agent of a similar disease of poppies. Light brown or yellow, later black blotches occur on the upper side of the leaves, the corresponding areas on the lower surface being covered with a white or grey to faintly mauve down. The infection also involves the buds, calyces, seed-capsules, and seeds. The fungus overwinters in the soil or on plant débris, especially capsules, by means of the oospores, the presence of which in and on the seed strongly points to the latter as a source of transmission. Control measures should include thorough sanitation and the use of clean seed.

YOSHII (H.). **On the pathogenic organism of the leaf spot of Gomphrena globosa.**—*Ann. Phytopath. Soc. Japan*, ii, 6, pp. 513–519, 1 fig., 1933. [Japanese, with English summary.]

A fungus closely resembling *Macrosporium* [*Alternaria*] *solani*, *M. carotae*, or *M. porri* [*R.A.M.*, x, p. 436; xi, p. 224] was isolated from leaf spots on *Gomphrena globosa* at Fukuoka, Japan, and its pathogenicity proved by inoculation experiments. The organism is stated to correspond morphologically with *A. gomphrenae* Togashi, differing considerably from the latter, however, in cultural characters. The conidia produced on the host are long, tapering, and slender-beaked, arising singly at the tips of the conidiophores. Ordinary cultural methods failed to yield conidia, which developed,

however, from hyphal fragments kept for several days in a moist chamber.

JOHNSON (E. M.) & VALLEAU (W. D.). **Black-stem of Alfalfa, Red Clover and Sweet Clover.**—*Kentucky Agric. Exper. Stat. Res. Bull.* 339, pp. 57–82, 3 figs., 1933.

Details are given of the authors' investigations of the condition of lucerne, red clover (*Trifolium pratense*), and sweet clover [*Melilotus alba*] in Kentucky, which was recently described under the name black stem [*R.A.M.*, viii, p. 726; xi, p. 461]. The results showed that in each of these hosts the disease is caused by a different fungus. In lucerne the cause is a species of *Phoma* closely agreeing in its morphology with the description of *P. medicaginis* Malbr. & Roum., which is considered to be probably synonymous with *Phyllosticta medicaginis* [ibid., xi, p. 653]. Preference is given to the first name because the fungus lives throughout the year in the stems of the host, from which in the spring it spreads to the newly formed leaves and stems. In red clover the disease is caused by another species of *Phoma* which does not appear to have been described hitherto, and for which the name *P. trifolii* n. sp. is suggested; an English technical description is appended. It differs from *P. medicaginis* in spore shape, cultural characters, and in the rate at which it discolours the affected tissues. *Pleospora* perithecia were found in association with this fungus on dead red clover stems, but no evidence of a genetic connexion between the two has yet been obtained. The sweet clover pathogen was shown in pure culture to be probably identical with *Mycosphaerella lethalis* [ibid., iii, p. 610].

In all three hosts the greatest injury by the black stem pathogens is caused soon after growth is resumed in the spring, owing to extensive killing of the leaves and the tender young shoots. Blackening of the stems occurs chiefly late in the spring and, while it is the most conspicuous symptom, causes comparatively little damage to the crops. In lucerne and red clover black stem continues to develop during the summer if the crops are not cut down. The investigation also indicated that the disease plays an important part, previously unrecognized, in the failure of all three crops. Stands of red clover varieties unadapted to Kentucky conditions may be destroyed completely when about a year old, the injury being apparently cumulative from the preceding year, but varieties that have been grown there for many years appear to be little injured. Lucerne varieties seem to exhibit distinct differences of resistance, but under conditions favourable to the disease stands are greatly reduced and occasionally entirely destroyed. Individual sweet clover plants show marked differences in their susceptibility to injury from *M. lethalis*. It is believed that losses in red clover may be greatly minimized by the use of adapted varieties, and in lucerne by the destruction of the infected aerial parts through grazing or otherwise during summer.

TRIWOSCH (S.). **Das Eisen als Mittel zur Bekämpfung der Chlorose der gelben Lupine (Lupinus luteus) auf kalkhaltigen bzw. gekalkten Böden.** [Iron as a means of combating chlorosis

of the yellow Lupin (*Lupinus luteus*) on calcareous or limed soils.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxxi, 1–3, pp. 14–27, 1933.

The writer's investigations [which are fully described and tabulated] in Silesia indicate that the severity of chlorosis of the yellow lupin (*Lupinus luteus*) [*R.A.M.*, xi, p. 721] increases parallel with a rising lime content of the soil, but the primary source of the trouble appears to lie rather in a disparity between the amounts of lime and iron in the soil than in the alkalinity of the latter.

HARRISON (T. H.). **Brown rot of fruits and associated diseases of deciduous fruit trees. I. Historical review and critical remarks concerning taxonomy and nomenclature of the causal organisms.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxvii, pp. 132–177, 1933.

In this paper the author critically discusses the validity, in the light of the International Rules for botanical nomenclature, of the various taxonomic combinations used in the relevant literature [54 titles of which are cited in the bibliography appended] for the organisms causing brown rots of fruits and related diseases of the trees. In agreement with Roberts and Dunegan [*R.A.M.*, xii, p. 228], he considers that the correct binomial for the American brown rot fungus is *Sclerotinia fructicola* based on Winter's description of its apothecial stage in 1883 under the name *Ciboria fructicola* which was transferred in 1906 by Saccardo to the genus *Sclerotinia* on the authority of Rehm, and therefore easily antedates all the other combinations suggested. Schröter's combinations *S. cinerea* and *S. fructigena* are considered to be *nomina nuda*, since it is apparent from his descriptions that they referred only to the *Monilia* stage of the organisms; for this reason the combination *S. fructigena* Aderh. & Ruhl. must replace *S. fructigena* (Bon.) Schr. As a result of detailed studies made in England and on the continent of Europe in 1930–32, he further concludes that the fungus causing brown rot of apricots in Europe is co-specific with *S. cinerea*. Since, however, this name was first validly used in 1921 for the perfect stage which had already been properly described in 1905 by Aderhold and Ruhland under the name *S. laxa*, the latter combination must have priority and is therefore the correct one for the fungus. Evidence is adduced to show that the dominant form of this organism, which not only has an extensive host range among stone fruits but is found widely distributed in the northern hemisphere, is the biologic form *pruni* [ibid., vi, p. 619; viii, p. 179] which, furthermore, is the only one that has been connected with the perfect stage. In consequence, this form is considered as the type of the species, and the form names *pruni*, *cerasi*, and *avium* become superfluous and should be discontinued, the more so since the fungus has been shown also to affect pears and quinces. For the present, however, it is thought desirable to maintain the form name *mali* for the fungus Wormald proved to be the cause of blossom wilt of apples in England, and which should therefore be known as *S. laxa* f. *mali* [cf. ibid., ii, p. 547].

Finally, the author considers it preferable for the time being to retain all the species dealt with in the genus *Sclerotinia*, but in

the event of this genus being split up, the evidence available indicates that the fruit rotting species should be listed under the genus *Stromatinia* rather than under *Monilinia* [ibid., vii, p. 744].

BURRELL (A. B.) & PARKER (R. G.). **Field trials with lime-sulphur and Koppers flotation sulphur in Apple scab control.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 98–102, 1933.

Details are given of a single year's field tests on five commercial orchards of 14- to 26-year-old McIntosh apples in the Champlain Valley of New York to determine the relative efficacy against scab [*Venturia inaequalis*] of lime-sulphur solution (2½ galls. at 32° Baumé diluted to 100 galls.) and Koppers flotation sulphur [*R.A.M.*, xii, p. 572], used at the rate of 10 lb. per 100 galls. for the paste and 5 lb. for the dry wettable form. Lead arsenate was included in all applications at the rate of 2½ to 3 lb. per 100 galls. Six to nine applications were given with power sprayers delivering a pressure of 250 to 350 lb., except in one orchard where a Rex Liquiduster (in which a small stream of liquid under low pressure is introduced into the air current from a blower, and thereby broken up into a mist) was used. Good commercial control of scab (the incidence of which on the untreated trees ranged from 7 to 74 per cent.) was obtained in all the experimental orchards, the average amounts of infection on the flotation sulphur plots being 1·3 and 1 per cent. (paste and dry, respectively), and on those sprayed with lime-sulphur 0·2 to 0·3 per cent. The severe scorching of the foliage conspicuous in two of the lime-sulphur series was entirely absent from those treated with flotation sulphur, and was traceable to the pink and petal fall sprays having been given during damp weather.

MACDANIELS (L. H.) & BURRELL (A. B.). **The effect of sulfur fungicides applied during bloom on the set of Apple fruits.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, p. 61, 1933.

The results of experiments in three localities of New York State indicated that an approximately equal reduction in the set of apple blossoms followed the application of either lime-sulphur 1 in 40 or sulphur dust, the heaviest decline being caused by treatment 24 hours before pollination, and the next by applications simultaneous with pollination. Under favourable pollination conditions the fruit can apparently be treated late in the flowering period without detrimental effects.

HOFFMAN (M. B.). **The effect of certain spray materials on the carbon dioxide assimilation by McIntosh Apple leaves.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 389–393, 1933.

Details are given of an experiment in which it was shown that the application of lime-sulphur (2½ in 100 galls.) caused a considerable reduction in carbon dioxide utilization by McIntosh apple leaves even when there was no sign of leaf injury, the effect persisting for a fortnight after treatment. This phenomenon was specially noticeable in the lighter green foliage, the photosynthetic activity of which declined markedly (down to only 3 per cent. of that of the unsprayed in one test) on the first day after spraying

and only partially recovered (65 per cent. reduction) on the second day. Lime-sulphur being generally used in the early part of the season, when a heavy organic food supply is demanded by the rapidly developing trees, any loss of leaf efficiency at this time may seriously affect fruit setting and other activities. The slight reduction of carbon dioxide assimilation sometimes following treatment with Bordeaux mixture in the author's tests was purely temporary and is attributed to a physical effect of the precipitate rather than to a chemical disturbance.

McCLINTOCK (J. A.). **The source of Apple seedlings in relation to blotch infection.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 359–360, 1933.

Every year since 1923, when attention was first called by M. W. Gardner and H. S. Jackson to the frequent occurrence of blotch [*Phyllosticta solitaria*] on apple seedlings [*R.A.M.*, iii, p. 277], the writer has observed cankers on mid-western nursery trees, the percentage of infection reaching a maximum of 47 in 1931. Under Federal quarantine regulations European apple seedlings may not be imported into the United States, so that the blotch-free French crab seedlings are no longer available for grafting or budding. In any case the resistance of the French material to *P. solitaria* was not maintained in the Middle West, and the solution of the problem thus appears to lie in the procurement of nursery material from the Pacific coast States in which, according to official records cited by N. E. Stevens in correspondence, the disease does not occur spontaneously. The writer has for several years verified the absence of blotch on western seedlings by a close examination of commercial shipments.

BRAUN (K.). **Obstfäulnis bei Aepfeln und ihre Verhütung.** [Decay of Apple fruits and its prevention.]—Reprinted from *Landw. Wochenbl. und Genossenschaftl. Mitteil. Schleswig-Holstein*, lxxxiii, 31, 33, 35, 37, 6 pp., [1933].

Full directions are given in popular terms for the prevention of some important fungous diseases of stored apples by suitable site and type of store, temperature, humidity, light, ventilation, and other practical measures. The diseases usually encountered are bitter rot (*Gloeosporium fructigenum*) [*Glomerella cingulata*], brown rot (*Cylindrocarpon mali*) [*Nectria galligena*], grey rot or mould (*Botrytis cinerea*), green rot or mould (*Penicillium glaucum*), kernel rot (*Fusarium herbarum*: syn. *F. putrefaciens*) [*R.A.M.*, ix, p. 253; xi, p. 53], *Mucor* sp., black rot or cushion mould (*Sclerotinia fructigena*), *Phoma* rot, pink mould (*Trichothecium roseum*), and *Sphaeropsis* rot [*Physalospora cydoniae*].

KIDD (F.) & WEST (C.). **Gas storage of fruit. III. Lane's Prince Albert Apples.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 149–170, 1 diag., 2 graphs, 1933.

This is a detailed account of the results obtained in experiments in 1931–2, in which the effect was studied of storage in regulated atmospheres at different low temperatures on Lane's Prince Albert apples, and which were conducted on the same lines (save for

certain modifications in the composition of the atmospheres) as those described for Bramley's Seedlings in a previous communication [*R.A.M.*, ix, p. 533]. Notes were taken on the physical and chemical changes that occurred in the fruit, and also on the various functional breakdowns (superficial scald, brown heart, internal breakdown, and core flush) and fungal decays that developed during storage under the different conditions. The best conditions for this variety of apples appeared to be an atmosphere containing 2·5 per cent. oxygen and 5 per cent. carbon dioxide at a temperature of 4° C. (39° F.), since the commercial storage life of the fruit thus treated was twice as long as that of apples kept in air at the same temperature, and nearly twice as long as that in air at 34° F. (ordinary cold storage).

OLLIVER (MAMIE) & SMITH (G.). **Byssochlamys fulva, sp. nov.**—*Journ. of Botany*, lxxi, 847, pp. 196–197, 1 pl., 1933.

In this description (in which a Latin diagnosis is included) of *Byssochlamys fulva* sp. nov. the authors state that the fungus, which was frequently isolated from processed fruits, appears to be fairly widespread in England, and is of considerable economic importance as a cause of spoilage in tinned and bottled fruits. In this second species of the genus *Byssochlamys* established by Westling in 1909, the conidial fructification is of the *Paecilomyces* type and the fungus is readily disseminated by the abundant, elliptical conidia, 4 to 9 by 2·3 to 2·5 μ in diameter, borne in long chains. The globose asci, which measure 11 to 12 μ in diameter, are produced in clusters without any peridium or enveloping hyphae, so that the fungus is a transitional form between the Endomycetaceae and the Gymnoascaceae. The smooth, hyaline, ovate ascospores, 8 to the ascus, measure 6 to 6·5 by 4·3 to 4·5 μ.

The natural habitat has not yet been found, all the isolations having been made from tinned and bottled fruits. The mature spores survive cooking for thirty minutes at 87° to 88° C.

MARSH (R. W.). **Observations on Pear scab.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 101–112, 3 figs., 1 diag., 1933.

The study of the mechanism of infection of pear shoots (of the very susceptible Fertility variety) by *Venturia pirina* [*R.A.M.*, xii, p. 639] showed that the first stages of the process are very similar to those in apple shoot infections by *V. inaequalis* [ibid., xi, p. 725], with the difference that the pear scab fungus appears to be more frequently able to penetrate cork in process of formation than the latter, and is thus able to start infections at a considerable distance from the tip of the growing shoot. Once the under side of the bark is reached, the fungus spreads not only in the phellogen but also in the collenchymatous layers of the cortex, where the hyphal tips penetrate the thick cell-walls and continue to grow in the middle lamellae. Adjoining cells are wedged apart by the stouter portions of the hyphae, and are finally completely surrounded by them. The penetration of the cortex occurs much more rapidly in the tangential than in the radial direction, and results, during the summer months, in the formation of a shallow

stroma, which may attain 2 to 3 mm. in length, and which includes the remains of the disintegrated collenchyma. The development of such primary stromata is restricted by the formation of cork barriers before the end of the summer period of shoot growth, but occasionally the barriers may be passed radially by the fungus before complete suberization or, more commonly, they may fail to unite with the normal cork at the perimeter of the lesion in time to prevent fresh extensions of the fungus. During the winter, and owing to the fact that no new cork formation occurs in the host, the hyphae of the subsidiary stromata thus formed interpenetrate the cortical cells below, while above they form distinct pseudo-parenchymatous columns, visible to the naked eye as a ring of protuberances forcing up the bark. By January spore formation is common on the sides of these columns, and at any time in the first three months of the year large flakes (at times 1 cm. long) of the bark are forced off by the pressure exerted by the fungus, thus exposing the fungus stroma with its numerous papillate spore-bearing structures united on a common base.

As indicated by spore-catching experiments [the results of which are shown in tables] at Evesham and Long Ashton, dissemination of the new spores may start in January, but does not reach its maximum until March or April. Towards the end of April the activity of the pustules is checked and eventually stopped following the renewal of growth by the shoots, when new phellogen develops and extensive cork barriers are formed beneath the infected areas, with the result that by June the abscission of the latter is complete and the lesions are shed, leaving a concave, cork-lined scar on the shoot.

The remainder of the paper is given to a brief discussion of the results obtained in 1931 and 1932 in spraying experiments in a commercial Fertility pear plantation near Evesham. It was found that under conditions favourable to the disease (1932) two sprayings were useless, while with six applications the proportion of clean fruit was raised from 2 per cent. in the controls to 60 per cent. in the treated plots. The Doyenné du Comice variety appears to be particularly susceptible to damage from lime-sulphur and Bordeaux mixture.

TAI (F. L.). **Pear rust caused by Gymnosporangium haraeanum Syd. and its control.**—*Nanking Journ.*, iii, pp. 143–152, 9 figs., 1933. [Chinese, with English summary.]

The rust *Gymnosporangium haraeanum* is stated to damage foreign and native pears (*Pyrus communis, P. calleryana, P. betulaefolia, P. serotina, P. sinensis*), quinces, *Chaenomeles* [*Cydonia*] *lagenaria, Crataegus cuneata,* and *Juniperus chinensis* in China. Most foreign pear varieties are immune from the disease, but Garber, Kieffer [*R.A.M.*, v, p. 107], Laurence, Le Conte, and Flemish Beauty are susceptible, though less so than the Chinese species, which are very severely attacked. Inoculation experiments on quinces and *P. serotina* with teleutospores of the rust from the leaves and twigs of *J. chinensis* gave positive results in 1925 and 1928. A comparison is made between *G. haraeanum* and *G.*

japonicum, both attacking *J. chinensis*. A reduction of 43 per cent. in the number of diseased pear leaves was effected by spraying in 1931.

HUTCHINS (L. M.). **Identification and control of the phony disease of the Peach.**—*Office of the State Entomologist, Georgia, Bull.* 78, 55 pp., 3 col. pl., 15 figs., 2 maps, 1933.

In little more than ten years phony disease [*R.A.M.*, xii, p, 703] has attacked over one million peach trees in Georgia, where forty years ago it was no more than a curiosity. First recognized as commercially important in 1915, it rapidly became enormously destructive in the heavily planted central regions of Georgia, and spread to Florida, Alabama, Mississippi, Tennessee, and the Carolinas, as well as to parts of Louisiana, Texas, Arkansas, Oklahoma, Missouri, and Illinois, the accompanying maps showing its distribution in 1928 and 1933. In one property covering 1,000 acres in Georgia and originally yielding 250 carloads of fruit annually, the disease, which had affected an occasional tree in 1900, from 1915 onwards became so devastating that in 1928 no fruit could be sent out, and all the blocks of bearing trees had to be cut down, some 600 acres of what had once been among the finest peach orchards in Georgia being planted to grain. In the same locality a block of 2,100 Hiley trees planted in January, 1919 showed 90 and over 1,200 affected trees in 1921 and 1927 respectively, while by 1931 over 99 per cent. had become diseased. In another planting, separated from the others by several miles of farm lands and woods and where in 1921 out of 50,000 trees fewer than 0·1 per cent. were affected, in 1931–2 3,980 trees had to be cut down, most of the increase having occurred in the previous four or five years.

From 1929 to 1932, inclusive, 40,538,560 peach trees, practically all in commercial orchards, were inspected during the phony peach eradication campaign, and of this number 449,754 were found to be affected, 437,038 in Georgia alone.

In addition to the external symptoms already noted, which are recapitulated at length [ibid., viii, p. 388 ; ix, p. 727], brown streaks are often seen running lengthwise through much of the woody cylinder of trees long or severely affected.

A simple identification test for phony disease applicable at any time of the year consists in taking clean, white, unblemished root pieces 4 to 6 in. long, the woody cylinder being 0·5 to 0·75 in. in diameter, from each of four sides of the tree and remote from any malformation or injury, washing, removing the excess water, and immersing transverse sections 0·5 to 1 mm. thick in a reagent prepared by adding 1 to 5 (generally 2 or 3) drops of concentrated, chemically pure solution of hydrochloric acid to each 25 cc. of absolute methyl alcohol. A positive result is indicated when 10 to 50 or more definite, intensely coloured, purplish spots up to 2 mm. in diameter and distributed over the entire surface of the section show up against a clear background of whitish or faintly purple or lavender wood. In a well-developed case of the disease every suitable root generally gives a good positive result. Very often a conclusive positive test is obtained before the tree has emerged from the incubation period of the disease.

In old infections faintly discernible to definitely brown spots (due to the brown streaks referred to above) may appear in the wood; if these are tested as described, they turn purple, and a large number of new spots, previously invisible to the naked eye, will appear.

As a rule, two full seasons' growth are required before the symptoms of phony peach become definitely recognizable.

Exhaustive tests are described which showed that the disease may be readily transmitted experimentally by root-grafting, even minute portions of the roots of diseased trees sufficing to infect healthy ones.

Circumstantial evidence points to the peach borer (*Aegeria exitiosa*) as the insect vector of the virus.

The only practicable method of control is to destroy the diseased trees immediately the symptoms are identified.

CRISTINZIO (M.). **Osservazioni su una malattia del Pesco.** [Observations on a disease of the Peach.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, ii, pp. 28–44, 4 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, p. 325, 1933].

An outbreak of a die-back of peach branches in some orchards in the neighbourhood of Naples caused by *Cytospora leucostoma* [cf. *R.A.M.*, xi, p. 745] leads the author to recommend the removal from affected orchards of all the dead trees, together with a severe pruning of all the infected ones. The trees, after pruning, should be thoroughly swabbed with a 15 to 20 per cent. solution of iron sulphate while still in the dormant stage. An extensive bibliography on the genus *Cytospora* and related fungi is appended.

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees, II: effect of zinc and other treatments.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 255–263, 1 fig., 1933.

During the winter and spring of 1931–2 many trees affected by little leaf in California were treated with zinc compounds and some with other substances [*R.A.M.*, xii, p. 99]. Peach trees in sandy soil receiving quantities of zinc sulphate ranging from 1 lb. over a radius of 8 in. round the trunk to 100 lb. over 10 ft. showed varying degrees of improvement after shorter or longer periods. Used at the rate of 5 or 10 lb. over a 7 ft. radius, zinc sulphate produced effects comparable to those obtained with 20 to 40 lb. of impure ferrous sulphate. The action of zinc chloride (5 to 20 lb.) approximated to that of zinc sulphate at the same rate. Apple trees in sandy loam responded to applications of 15 to 30 lb. zinc sulphate over a radius of 6 ft., while a striking improvement was manifested by Payne walnuts receiving 10 to 15 lb. over a 3 ft. radius. Santa Rosa plum trees in sandy loam reacted very favourably to the application of either 5½ lb. zinc sulphate alone or 5 lb. zinc sulphate + 5 lb. ferrous sulphate in basins with a radius of 2½ ft., while almost equally good results were given by surface applications of the former at the rate of 9 lb. over a 7 ft. radius or 6 lb. over 3 ft. Old orange trees in very heavy loam with coarse sand were markedly benefited by 20 to 40 lb. zinc sulphate over

an 8 ft. radius, smaller amounts giving less satisfactory results. Younger trees showed complete recovery after treatment with 5 lb. over a radius of 1 ft. or 10 to 20 lb. over 4 ft. Applied at the rate of 20 to 50 lb. over a radius of 3 ft. zinc sulphate also corrected a condition resembling and probably identical with little leaf in corral soils. In a few tests on peach, apple, and orange trees beneficial effects were also obtained by injecting zinc sulphate into holes in the trunk [cf. ibid., x, p. 677]. A spray consisting of 6 lb. each of zinc sulphate and hydrated lime in 50 galls. was applied to affected vines and other trees on 17th June, 1932, with excellent results in the case of the first-named.

Some observations made in the course of these experiments throw doubt on the obvious inference from the results, i.e., that little leaf is a sequel to a deficiency of zinc for normal metabolism. It is scarcely probable, indeed, that zinc would be lacking over such extensive and diverse areas as those comprised between the Canadian boundary in Washington and Mexico in the south and Georgia in the east, and a climatic influence seems more likely to operate in the distribution of little leaf. Chromogenic bacteria, liberating very toxic substances, have been isolated from the soil in affected areas, and it is thought possible that such poisonous elements may be precipitated by compounds of zinc, mercury, silver, and calcium in higher concentrations.

WALLACE (T.) & PROEBSTING (E. L.). **The potassium status of soils and fruit plants in some cases of potassium deficiency.** —*Journ. Pomol. and Hort. Science*, xi, 2, pp. 120–148, 1933.

A detailed account is given of the authors' chemical analysis of surface soil samples from 23 different centres in England, where fruit trees and bushes exhibited marked potassium deficiency associated with leaf scorch [cf. *R.A.M.*, x, p. 802]. The results showed that such soils contained low amounts (as judged by standards set for agricultural plants) of potassium present as water extractable, citric acid soluble (Dyer's method), and replaceable (exchangeable) forms. The analysis of samples of similar soils, but which had received heavy dressings of potassic or farmyard manures for considerable periods, revealed the presence in them of large percentages of the added potassium in the exchangeable form, while single year dressings with these manures, which were effective in overcoming the deficiency effects, also caused significant increases in the amounts of potassium present in the soil in all three forms. These manurial treatments significantly raised the potassium contents of the plants [loc. cit.].

GUBA (E. F.). **'Suspected mosaic' of the Strawberry.**—*Phytopath.*, xxiii, 8, pp. 654–661, 4 figs., 1933.

In Massachusetts the strawberry disease known as 'gold leaf' [*R.A.M.*, xii, p. 494] is restricted to the Howard 17 variety, in which it induces degeneration of the plants. In districts outside New England the same disorder (which has been designated 'suspected mosaic' by Berkeley in Canada [ibid., xi, p. 252] and 'non-infectious chlorosis' by J. H. Clark in New York [ibid., xii, p. 204]) has been reported on the Van Dyke, Eaton, and other new

varieties. It is evidently identical with the chlorosis [yellows or xanthosis] studied by Plakidas [ibid., xii, p. 520; see also xi, p. 250].

An important feature of the chlorotic condition is its development in late April after the new beds are planted, followed by disappearance in the first week in July. The leaves, flowers, and fruit show all stages of dwarfing but no mosaic symptoms have been detected on the fruit.

The writer has found that seed from affected plants produces both chlorotic and healthy seedlings, the former showing a marked tendency to stunting and their ultimate death being associated with an almost complete absence of chlorophyll. The latter feature is typical of genetic chloroses as opposed to the degeneration of chlorophyll accompanying virus diseases. Negative results were given by experiments in the transmission of gold leaf by various insects, as well as by inoculation with the sap of diseased plants. The condition of the chlorotic plants was not improved by the application of different fertilizers.

In the spring of 1932 gold leaf suddenly developed in a bed of Howard 17 strawberries raised from seed, the stock having been entirely free from the disturbance as long as vegetative propagation had been followed. Accepting the hypothesis of a genetic origin of the disorder, the use of volunteer seedlings for propagation would account for its extension. Gold leaf is systemic, and since its manifestations are not apparent until the early spring, the use of daughter plants from chlorotic mother strawberries for the new beds cannot well be avoided. Experiments have shown that roguing and selection are ineffectual against gold leaf, the symptoms of which may be masked or modified by dry spring conditions. The recessive genetic factor responsible for gold leaf is considered to be dependent on certain environmental conditions for its expression.

BERGMAN (H. F.) & TRURAN (W. E.). **An apparent case of transmission of Cranberry false blossom through a natural graft.** —*Phytopath.*, xxiii, 8, pp. 670–672, 1 fig., 1933.

Hitherto the transmission of false blossom of cranberry [*R.A.M.*, xii, p. 706] was practicable only with the aid of the leafhopper, *Ophiola striatula* [*Euscelis striatulus*], but in 1932 the symptoms of the disease were observed on a natural graft between an apparently healthy and a diseased cutting of the Wales Henry variety in Massachusetts. Infection seemed to proceed upwards from the line of union in the graft.

DAVEY (A. E.) & SMITH (R. E.). **The epidemiology of Fig spoilage.** —*Hilgardia*, vii, 13, pp. 523–551, 4 figs., 1933.

Continuing their studies at Merced, California, on the epidemiology of the spoilage diseases of uncaprified, second-crop Adriatic figs [*R.A.M.*, xi, p. 522], the writers found that, up to about 1st July 1932, nearly all the green, almost full-grown figs with closed eyes were internally sterile, but the fruit approaching maturity subsequent to that date was found to contain an increasing percentage of bacteria, yeasts, and moulds (*Alternaria*, *Cladosporium*, *Hormodendrum*, *Macrosporium*, and *Penicillium* spp.).

The fig-smut fungus (*Aspergillus niger*) was detected in a small proportion of the fruit previous to the opening of the eyes, and early in August there was a sudden marked increase in the development of this organism and *Rhizopus* sp., closely followed by souring due to various yeasts. In the early stages, before the eye of the fig opens, mites may be responsible for introducing these organisms, and later on they may be carried by the dried-fruit beetle (*Carpophilus hemipterus*), but conclusive evidence on the relation between particular insects and moulds is still lacking.

SIMMONDS (J. H.). **Squirter disease of Bananas.**—*Queensland Agric. Journ.*, xl, 2, pp. 98–115, 3 pl., 1 graph, 1933.

After briefly reviewing the symptoms, geographical distribution, economic importance, and history of squirter disease of bananas [*R.A.M.*, xii, p. 40] the author states that affected material in Queensland consistently yielded an organism identified at the Imperial Mycological Institute as *Nigrospora sphaerica*, inoculations with which into healthy bananas gave typical squirter, the fungus being reisolated. Natural infections generally take place through the broken fruit-stalk, but sometimes through the apex or through lateral wounds.

The organism was frequently present on banana refuse near the packing-sheds and on dead trash on the ground or hanging round the pseudostem in the plantations. It was found fairly consistently on white leaf lesions due apparently to sun scald. In one plantation where loss had been sustained spores were noted on the surface of the skin of fruits in the packing-shed.

Nigrospora spores were also found on the dead parts of *Digitaria didactyla* [*Panicum didactylum*], *Pennisetum clandestinum*, *Chloris gayana*, sorghum, *Sorghum halepense* [*Andropogon halepensis*], *Paspalum dilatatum*, *Rynchelytrum roseum*, and *Imperata cylindrica* var. *koenigii*. According to spore measurements the fungus on the first five of these belonged to the *N. sphaerica* group, while on the last three the spores were smaller, resembling two squirter strains in this respect. Bananas inoculated with cultures and spores from some of these hosts developed typical rot, from which the *Nigrospora* was reisolated.

For the present all the forms of *Nigrospora* associated with monocotyledons in Queensland should, in the author's opinion, be regarded as belonging to the group included in the species represented by *N. sphaerica* (Sacc.) Mason, though a distinct strain marked by certain cultural features and its greater pathogenicity towards banana fruits is probably responsible for most of the squirter trouble. In most cases the fruit is probably contaminated before the bunch is cut.

Over 80 strains of *Nigrospora* isolated from seven hosts fell, as regards cultural characters, into two main groups of which one, characterized by straggly hyphae, included all the isolations from typical squirter as well as others from the leaf, bunch spathe, petiole, and fruit surface of bananas, and from sorghum, *A. halepensis*, and *P. clandestinum*. Strains from the second group were obtained from banana leaf, petiole, and fruit surface, *P. didactylum*, *P. dilatatum*, and *R. roseum*. A few other distinct forms were

observed. Though definite lesions resulted from inoculations with the second group, the evidence suggested that the strains of the straggly type are the most actively pathogenic and are those which cause squirter. This type appeared most frequently in material collected shortly after an exceptionally cold spell.

Between 1928 and 1933 the first outbreak of the year and some of the worst later ones often followed a sudden drop in the minimum field temperature to between 40° and 45° F. When the disease occurred the average temperature in Melbourne was usually well below 60°. Infection is not generally severe until about midwinter (the end of June), but it may continue into the spring.

The optimum temperature for strains of *N. sphaerica* from original squirter infections ranged from 72° to 77°; there was little growth below 50° and none at about 91°. The maximum amount of fruit rotting took place at a temperature a few degrees below the optimum for the growth of the fungus. Typical squirter is produced only in the intermediate stages of ripening. If present, a temperature factor must therefore act in regard to the fruit itself. That the method of ripening definitely affects squirter development was shown by the fact that inoculated fruits ripened under standard conditions (66° to 69°) had an average length of only 2·6 cm. of rotted tissue, as compared with 6·4 cm. in fruits ripened without gas at 61° to 70°.

Notes are given on control by improved sanitation and packing methods (packing in 'hands' not 'singles'), and the protection of the fruit against cold.

[This paper is reprinted as *Queensland Dept. of Agric. & Stock, Divn. of Ent. & Plant Path. Pamphl.* 11, 17 pp., 3 pl., 1 graph, 1933.]

McLennan (Ethel I.) & Hoëtte (Shirley). **Nigrospora musae n. sp. and its connexion with 'squirter' disease in Bananas.** —*Australian Inst. Sci. and Indus. Res. Bull.*, 75, 36 pp., 1 pl., 9 figs., 5 graphs, 1933.

In the flesh of bananas affected with squirter disease [see preceding abstract] the authors constantly found the inter- and intracellular hyphae, 3 to 10 μ in diameter, of a *Nigrospora*. In plate culture on malt agar the fungus formed a water-soaked, staled colony with very characteristic cottony white strands growing towards the lid of the plate and gradually covering the whole surface until it resembled cotton wool. The upper surface was white, the lower one becoming olive-citrine to nearly black. The light brown, later black, subspherical spores borne on short inflated conidiophores or at the ends of side branches from the main hyphae averaged 18 by 15 μ. The minimum, optimum, and maximum growth temperatures were 5°, 19°, and 32·5° C., respectively.

The organism corresponded in spore size with cultures of *N. sphaerica* (16 to 18 μ) and *N. panici* (17 to 19 μ) [*R.A.M.*, vi, p. 758] obtained from Baarn, but differed from them so considerably in cultural characters and growth rate that it is regarded as a distinct species and is named *N. musae* n. sp., this being the first Australian record of the genus. It was also isolated from banana leaves.

Another *Nigrospora*, obtained from the leaves only, had jet-black, subspherical spores measuring 10 by 17 μ. On malt agar a ten-day-old culture showed a cottony upper surface due to vertical strands of hyphae which, however, did not grow to the edge of the dish. The colony was distinctly zoned and as a whole was a dirty cream, though the lower surface was pale orange to orange-buff. No growth took place at 6·5°, the optimum growth temperature was 28°, and the maximum over 32°. As the fungus did not agree with any previously described *Nigrospora* and was quite distinct from *N. musae*, it is named *N. canescens* n. sp. It was not pathogenic to injured green bananas.

A few hyphae were found in the stalks of all the squirter bananas examined; the path of infection into and through the fruit was traced, and it was ascertained that the characteristic unaffected area at the stalk end results from the limitation (during the early stages) of the fungus to the vascular tissue until it reaches the ovular region.

Inoculation experiments demonstrated that *N. musae* is pathogenic to injured green banana fruits though having little effect on ripe ones, and that when the inoculum was placed on or into the cut ends of the stalks of green bananas, under suitable conditions of temperature and humidity, squirter symptoms were reproduced in the laboratory. *N. sphaerica* was also pathogenic, producing a soft brown rot resembling that caused by *N. musae* but less extensive. *N. oryzae* and *N. panici* were not pathogenic.

The localization of squirter to fruit ripened in Sydney and Melbourne was found to be correlated with the method of packing in 'singles', i.e., individual fruit, instead of in bunches.

Passionfruit in N.S.W. Crops reduced by fungoid disease.—*Fruit World of Australasia*, xxxiv, 7, p. 382, 1933.

Twenty years ago the average yield of each passion-fruit vine [*Passiflora edulis*] in New South Wales was half a bushel of fruit, whereas to-day it has fallen to one-quarter of a bushel, with the result that although there are at present 250,000 vines in bearing in the State, or twice as many as there were twenty years ago, the total production remains about the same, i.e. 50,000 bushels. The main cause of this situation is the failure of the growers to adopt proper control methods against the two diseases, brown spot [*Macrosporium* sp.: *R.A.M.*, x, p. 394; xii, p. 576], which has worked havoc on coastal plantations, and woodiness [ibid., viii, p. 185].

MARSAIS (P.). **La préparation des bouillies bordelaises exposée à la Ligue de lutte contre les ennemis des cultures.** [The preparation of Bordeaux mixtures discussed at the League for combating the enemies of cultivated plants.]—*Rev. de Vitic.*, lxxix, 2039, pp. 69–79, 1933.

This is a fairly full review of the papers that were read by French and Swiss workers at the meeting on 18th May, 1933, of the French League for combating the enemies of cultivated plants [*R.A.M.*, vi, p. 429], on the preparation of Bordeaux mixture for

the control of various crop diseases. In the discussion that ensued, widely diverging views were manifest regarding the value of the different methods of preparation now in vogue, and, in summarizing all the points raised, P. Viala, the Chairman, considered that the progress so far reached in the investigation of the problems involved was insufficient to allow of authoritative recommendations being made to practical growers. In his view the final criterion of the relative value of any of the methods considered is the efficacy of the mixture so prepared when tested in the field.

DESRUE (A.). **Les mouillants en agriculture.** [Spreaders in agriculture.]—*Rev. de Vitic.*, lxxviii, 2035, pp. 405–411, 1933.

The bulk of this paper is given to a general discussion of the practical desiderata which should be fulfilled by a spreading agent to increase the wetting capacity of spray liquids. This capacity, in practice, is a function of many factors, e.g., the pressure in the spraying apparatus, the velocity of the spray on reaching the leaves, the angle of incidence of the latter, and the like, and does not depend mainly, as many previous investigators seem to suggest, on the surface tension alone of the spray fluid [cf. *R.A.M.*, xii, p. 138]. He advises that no spreader should be recommended for extensive practical usage before carefully testing its efficacy in the field under varied conditions of application (pressure, etc.). Details are also given of the author's experiments [chiefly with insecticidal sprays] in 1932 and 1933, the results of which showed the great efficacy as spreaders of sulphonated terpene alcohols (recently put on the market under the name 'emol'), the main advantages of which consist in their compatibility with most of the usual fungicidal and insecticidal mixtures and solutions (except potassium permanganate), entire neutrality or very slight tendency towards alkalinity, ensuring their complete harmlessness to the host leaves, and their rapid elimination from the leaves after spraying. The dose recommended by the author is 250 gm. of emol to 1 hectol. of the spray mixture, and it is stated that all the leaf surfaces so far tested were found to be thoroughly wetted by sprays containing this preparation.

CHEVALIER (G.). **Le pouvoir mouillant des bouillies cupriques et des émulsions antiparasitaires. Son évaluation.** [Evaluation of the wetting capacity of cupric mixtures and parasiticidal emulsions.]—*Rev. de Vitic.*, lxxix, 2037, pp. 26–31, 1933.

The author tested the relative value of a number of substances (including seven proprietary preparations of unknown composition and origin) used as spreaders to increase the wetting capacity of cupric sprays and insecticidal emulsions, as measured by the proportional reduction brought about by these substances in the surface tension of the spray liquids, the latter being determined by the stalagmometer method [*R.A.M.*, xii, p. 139, and preceding abstract]. The results [which are presented in the form of tables] of tests with 2 per cent. Bordeaux mixture showed that the heaviest and most adhesive deposit of metallic copper on glass slides and vine leaves after two washings with artificial rain was

obtained with the proprietary preparations C and E, which reduced the surface tension of the normal spray from 0·990 (that of water being arbitrarily fixed as 1) to 0·543 and 0·583, respectively. At values above this range, the deposit accumulated in too small quantities and was less soluble, while at lower values, the spray was too fluid and deposited little copper, the latter being easily washed off by the artificial rain. Similar results were obtained after the addition of lead arsenate to the Bordeaux mixture.

NATTRASS (R. M.). **The control of fungus diseases.**—*Dept. of Agric., Cyprus, Bull.* 1 (Mycol. Ser.), 12 pp., 4 figs., 1933.

Directions are given in popular terms for the control of some important plant diseases in Cyprus by spraying and dusting with standard fungicides and by the indirect methods of good cultivation, including thorough sanitation, crop rotation, and the use of healthy and disease-resistant planting material.

SPIERENBURG (DINA). **Een ziekte in het Zeegras (Zostera marina L.).** [A disease of Seagrass (*Zostera marina* L.).]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 193–199, 1 pl., 1933.

In the late summer of 1932 the attention of the Dutch Phytopathological Service was drawn by the Fishery Biological Investigation Department to the occurrence of a disease in the grass-wrack seaweed (*Zostera marina*) [*R.A.M.*, xii, p. 711] along the coast of the Zuiderzee, and on 6th September an article appeared in the *Nieuwe Rotterdamsche Courant* suggesting that the drainage operations then in progress might be a contributory cause. The disease, however, has since been reported not only from other parts of Holland (e.g., east of Texel) but also from foreign countries, so that the drainage theory is scarcely tenable.

The writer examined specimens of healthy and diseased seaweed and found that in the latter the separating walls of the air canals were shrivelled, the cell contents and in some cases the vascular bundles being brown, while a few bacteria were detected in the tissues. A translation is given of the preliminary note by Fischer-Piette and his collaborators on the occurrence and supposed bacterial origin of the trouble in France [ibid., xii, p. 308].

COTTON (A. D.). **Disappearance of Zostera marina.**—*Nature*, cxxxii, 3329, p. 277, 1933.

The available information on the gradual disappearance of the grass-wrack seaweed (*Zostera marina*) from the coasts of Canada, the United States, France, and Holland [see preceding abstract] is briefly recapitulated, and attention drawn to a similar phenomenon at the old swannery at Abbotsbury, in various parts of Devon, and in the Thames estuary. In the affected English localities artificial feeding of the swans is necessary, while the marine fauna also suffers from the removal of extensive cover. Considerable topographical and physiographical alterations, moreover, may arise through the shifting of mud and sandbanks in consequence of the destruction of the chief mud- and sand-binder of estuaries and bays.

BAWDEN (F. C.). **Infra-red photography and virus diseases.**—*Nature*, cxxxii, 3326, p. 168, 3 figs., 1933.

By means of infra-red plates the writer has secured photographs giving a perfect contrast (unobtainable with panchromatic plates) between the healthy portions of potato leaves and those infected by streak [*R.A.M.*, xii, p. 48]. The normal leaf cells reflect the infra-red rays almost completely and come out white in positive, while those of the necrotic areas are jet-black. All potato necroses, regardless of the causative virus, behave similarly.

Totally divergent results are given, however, by the photography of tobacco necroses due to the '*x*' virus [ibid., xii, p. 587], which are virtually indistinguishable from the healthy leaf areas by the infra-red process, while showing up clearly when taken with panchromatic plates. This discrepancy is attributed to the fact that the dead cells of the potato necroses contain large amounts of breakdown products, rich in pectic substances and possibly in tannins, which completely absorb the infra-red rays. The *x* type of tobacco necroses, on the other hand, consist merely of dead empty cells reflecting the infra-red rays in the same degree as normal cells. All the necroses on *Nicotiana glutinosa* leaves infected by the *x* virus and ring spot show in panchromatic photographs, but somewhat faintly; with infra-red plates, on the other hand, only the lesions containing degeneration products appear, though these come out more definitely.

PUNKARI (LAILA) & HENRICI (A. T.). **A study of variation in a chromogenic asporogenous yeast.**—*Journ. of Bact.*, xxvi, 1, pp. 125–138, 2 figs., 1933.

Variations in a chromogenic, asporogenous yeast, *Torula pulcherrima*, which occurs in nature on various fruits, and has also been recovered from the nectar of flowers and from insects, were observed in giant colonies arising from single cell isolations on 1·5 per cent. agar. The variants were red and white, smooth and rough, the last-named forms being associated with incipient mycelial production. It was possible to obtain entirely smooth white, smooth red, and rough red colonies, but not rough white ones. For a time the variants tended to breed true to type, but at length continuous instability developed, leading on the one hand to the production of further new mutants, and on the other to a reversion to ancestral forms.

QUINTANILHA (A.). **Le problème de la sexualité chez les champignons. Recherches sur le genre 'Coprinus'.** [The problem of sexuality in fungi. Studies on the genus *Coprinus*.]—Reprinted from *Bol. Soc. Broteriana*, Coimbra, viii (Sér. II), 100 pp., 6 diags. (3 col.), 1933.

A comprehensive and fully tabulated account is given of the writer's studies on the problem of sex in fungi, as represented specially by the genus *Coprinus* [cf. *R.A.M.*, xii, p. 186]. References to contemporary investigations on the same subject occur throughout the paper, to which is appended a seven-page bibliography.

ROBB (W.). **Scottish Society for Research in Plant-Breeding, Report of the Director of Research to the Annual General Meeting, 13th July, 1933.**—32 pp., 3 figs., 1933.

In the section of this report (pp. 18–21) dealing with virus disease research [by E. C. Barton-Wright, G. Cockerham, and A. M. M'Bain] it is stated that in contrast to earlier results obtained, the evidence secured in 1932 showed that potato leaf roll [*R.A.M.*, xii, p. 48] does not markedly interfere with the production of sugars in the leaf, though there was some evidence of slight interruption in their transport out of the leaf.

Every King Edward potato plant examined (60 in all) for paracrinkle [ibid., xi, p. 594] had the disease in a latent form.

Beyond a slight retardation in the rate of formation of proteins and other nitrogenous compounds in leaf roll potatoes as compared with healthy ones, there was no fundamental difference in the protein metabolism of the two series.

In general, potato seed from parents affected with virus diseases was less viable and produced a greater number of degenerate seedlings than seed from healthy parents. Leaf roll and crinkle were more effective than simple mosaic in producing degeneracy in the seedling progeny.

Experimental evidence indicated that the Golden Wonder potato is resistant to certain virus diseases and may act as a symptomless carrier. In no instance did injury to the tubers, sprouts, or stem result in the appearance of any symptoms of virus attack in a previously symptomless plant.

CURRIE (J. F.). **The production of high-grade seed Potatoes in North Wales.**—*Journ. Min. Agric.*, xl, 4, pp. 316–326, 1 map, 1933.

After a brief reference to the work on the production of relatively virus-free seed potatoes reported in an earlier communication [*R.A.M.*, xii, p. 236], the author summarizes the results of tests in 1932, in which stocks of Sharpe's Express, Great Scot, and Kerr's Pink, produced at the North Wales centres started in 1930, were for the first time compared for their yield at four centres with the best obtainable Scotch seed of the same varieties. These results fully confirmed those obtained in the earlier trials, and demonstrated that the North Wales stocks are at least equal to the best stocks from Scotland both in health and in yield.

The North Wales seed-producing centres are situated in bleak and unsheltered districts, where climatic conditions tend to keep down the aphid population, particularly before the end of July. The potato fields are small and relatively far apart, thus affording a measure of protection against outside infection. In some areas the prevailing wind from the sea appears to cause a premature ripening and death of the potato haulms, and a similar effect is brought about by the early development of blight [*Phytophthora infestans*]. Both phenomena are believed to have the same effect as early lifting of the seed tubers, which is known to minimize the amount of virus infection in the crop.

The stock produced is being marketed as North Wales Certified

Seed Potatoes, containing not more than 0·5 per cent. of virus diseases and pure to the extent of 99·5 per cent.

KÖHLER (E.). **Untersuchungen über die Viruskrankheiten der Kartoffel. II. Studien zur Blattrollkrankheit.** [Investigations on the virus diseases of the Potato. II. Studies on leaf roll disease.]—*Phytopath. Zeitschr.*, vi, 4, pp. 359–369, 5 figs., 1933.

Continuing his investigations on the virus diseases of potatoes in Germany [*R.A.M.*, xii, p. 586], the writer gives details of his successful experiments in the transmission of leaf roll from the Frömsdorf to the President and Gustav Adolf varieties by means of the aphid *Myzus persicae* [cf. ibid., xii, p. 587].

DYKSTRA (T. P.). **Weeds as possible carriers of leaf roll and rugose mosaic of Potato.**—*Journ. Agric. Res.*, xlvii, 1, pp 17–32, 8 figs., 1933.

In the experiments reported in this paper leaf roll was successfully transmitted by the aphid *Myzus persicae* from potatoes to *Solanum villosum*, *S. dulcamara*, *Datura stramonium*, *D. tatula*, and tomatoes, while rugose mosaic [*R.A.M.*, xii, p. 588] was transmitted by leaf mutilation to *S. villosum*, *Physalis* sp., petunia, and tomato. When *S. villosum*, *D. stramonium*, and tomato infected with leaf roll were interplanted amongst healthy potatoes, and various insects (including *M. persicae*) were introduced, the potatoes contracted leaf roll in 82 per cent. of the tubers tested. Rugose mosaic was similarly transmitted to 53 per cent. of the tubers by interplanting healthy potatoes with diseased *S. villosum* and tomatoes. From potatoes infected with rugose mosaic *M. persicae* transmitted to tomatoes only the veinbanding component of the virus complex. In susceptible plants the veinbanding virus alone caused very slight symptoms, characterized in soft-leaved plants by a banding of the veins; when inoculated into apparently healthy potato plants, carrying the latent 'healthy potato virus', the veinbanding virus caused typical rugose mosaic, but in potato plants free from the latter virus, it only produced a faint type of mottling. The latent virus was not transmitted from apparently healthy potatoes to other solanaceous plants by *M. persicae*, nor was it transmitted to the two species of *Datura* by five other species of insects which occur naturally on potato, although *Datura* is very susceptible to field infection with this virus, which causes pronounced mottling on it.

The investigation is considered to have established that under certain conditions solanaceous weeds growing in proximity to potatoes may become infected with certain virus diseases of the crop, and may serve as sources of the infection in the crop.

WINGERBERG (F.). **Studien über den gewöhnlichen Kartoffelschorf und seine Erreger.** [Studies on common scab of Potatoes and its agents.]—*Kühn-Arch.*, xxxiii, pp. 258–296, 3 graphs, 1933.

In 1931 the writer isolated from scabbed potato tubers from various localities in Germany 21 strains of *Actinomyces* and grew them in comparative culture on oatmeal agar with four strains

from Baarn. Though these studies have not as yet allowed of the delimitation of the species included, it was found that there was considerable variability even with the subcultures from the individual strains. Thus, one of the Baarn strains, *A. flavus* [*R.A.M.*, xi, p. 200], produced white, yellow, and green sectors, the last-named with concentric red zonations, and these maintained their distinct characters. Five of the German strains were found to be relatively tolerant of an acid reaction (P_H 4·0), but in general an alkaline reaction is preferred. The same strain may behave quite differently on various media in respect of temperature and acidity tolerance. The capacity of certain strains for pigment formation was found to depend on the composition of the medium, one of the Baarn strains, for instance, failing to produce on potato-dextrose agar the greenish-yellow and purple colouring characterizing it on oatmeal agar. The abundance of pigmentation is correlated with the reaction of the medium, fluctuating with the rise or fall of the latter. In general, the influence of temperature on pigmentation is similar to that on growth.

In varietal reaction experiments scab was induced by the application to the soil of spore suspensions of *Actinomyces*, not only the tubers but also the underground parts of the stem contracting infection. All the varieties tested, both resistant and susceptible, were in process of active lenticel formation and showed no sign of the suberization to which resistance has been attributed [ibid., xi, p. 69]. Inherent physiological factors, rather than the temporary condition of the lenticels, are considered to be responsible for the resistance or susceptibility of varieties to scab. The results of the writer's tests showed certain discrepancies as compared with those obtained by Schlumberger [ibid., xii, p. 589], notably in regard to the Jubel and Erdgold varieties which have hitherto been placed, respectively, in the highly and moderately resistant groups. With the inoculation method used by the writer, Jubel can only be classed as partially resistant while Erdgold falls practically into the susceptible class.

BERKNER (F.). **Die Ursachen des Kartoffelschorfes und Wege zu seiner Bekämpfung.** [The causes of Potato scab and methods for its control.]—*Landw. Jahrb.*, lxxviii, 2, pp. 295–342, 3 figs., 1933.

A comprehensive, fully tabulated account is given of investigations (in collaboration with H. Schröder) at the Breslau Agricultural and Plant Breeding Institute on the etiology and control of potato scab.

Discussing the possible causes of the disease under the headings of (*a*) environmental and varietal factors, and (*b*) parasitic agents, including *Actinomyces scabies*, the writer inclines to a physiological rather than to a pathogenic explanation pending the support of the latter by stronger evidence than is at present available.

In suggestions for the control of the disease by manurial treatments the use of fresh stable manure is deprecated, while green manuring is favoured [*R.A.M.*, vi, p. 684; viii, p. 458]. Applications of lime at the rate of 20 doppelzentner per hect. should be given when required after the plants are 20 to 25 cm. in height. Even

when thus applied, however, the lime caused an increase in the incidence of scab proportional to the amounts given. The application of physiologically acid fertilizers, e.g., ammonium sulphate, superphosphate, and potassium sulphate [ibid., xii, p. 651], is beneficial. Crop rotation exercises a decisive influence on the development of potato scab, the following order being indicated on light, dry soils to maintain a reaction approximating to but not exceeding P_H 6·0: rye, oats, potatoes, lupins, and serradella [*Ornithopus sativus*], all of which make virtually equal demands on the lime supply.

The results of the writer's tests on varietal reaction to scab are discussed at considerable length and compared with those of Schlumberger and others [see preceding abstract]. Absolute immunity does not appear to exist, but there are decided hereditary differences in the degrees of resistance and susceptibility, the importance of which in relation to breeding is explained.

HUISMAN (T. J.). **De gewone schurft van de Aardappelknol.** [Common scab of the Potato tuber.]—*Tijdschr. over Plantziekten*, xxxix, 7, pp. 173–188, 1933.

In connexion with this survey of contemporary studies on potato scab (*Actinomyces scabies*), to which Prof. H. M. Quanjer contributes a foreword, the following local observations made in Friesland, Holland, are recorded. The disease is prevalent on ploughed-up grassland, although the contrary would be expected from the large quantities of green plant remains in the soil [cf. *R.A.M.*, ii, p. 520]. It has been noted in places that infection is reduced by a green manure of oats, sown in August and ploughed under in the autumn or spring. In an experiment to determine the influence of fertilizers on the incidence of scab in nine standard potato varieties, there was much less infection on the plots receiving ammonium sulphate and superphosphate (some being entirely healthy) than on those treated with basic slag and Chile saltpetre [see preceding abstract].

As regards varietal reaction to *A. scabies*, the Phytopathological Service has adjudged Eigenheimer, Eersteling [Duke of York], Ideal, and Industrie to be susceptible, while Roode Star, Erdgold, Jubileum, and probably Triumph have been found more resistant. This estimate is generally confirmed by the records of the Plant Breeding Institute, except that here Industrie, with Furore and Zeeuwsche Blaue, is placed in a somewhat less susceptible category. The Albion and Present varieties are added to the susceptible group, while moderate resistance is shown by Populair, Robijn, West Brabander, Alpha, Bevelander, Bintje, Thorbecke, and several others.

HOLLRUNG (M.). **100 Jahre Kartoffelkrankheit. Ein kritischer Rückblick.** [100 years of Potato disease. A critical retrospect.]—*Kühn-Arch.*, xxxiii, pp. 27–124, 4 figs., 1933.

The writer's retrospective survey of a century of potato blight (*Phytophthora infestans*) is preceded by an introduction giving the chief landmarks in the history of the disease, which the author thinks was quite possibly present in Europe as early as 1765, when

Gleditsch described a disease appearing about the time of blossoming. Several accounts of potato 'rust' in Germany in the first half of the nineteenth century are also thought probably to refer to blight. The paper includes the following sections: development of potato cultivation; precursory references to blight and its history from 1840 onwards; external and internal symptoms and etiology of the disease; recognition and evidence of the parasitic character of the fungus; morphology and biology of *P. infestans* and its methods of infection, in general and on the individual organs of the plant; the non-parasitic theory of the blight and its correlations with weather and soil conditions, fertilizing systems, manner of cultivation, varietal characters, and senescence; the lateness and suddenness of blight epidemics; and the development of healthy plants from diseased tubers.

The control of late blight is discussed under the headings of mechanical preventive measures (based on cultural practices); physiological methods of influencing the state of health of the plant (drainage, manuring, spraying, varietal selection, and breeding); and the destruction of the fungus by foliage, tuber, and soil disinfection.

Appended are a chronological list of the authors consulted and a 14-page bibliography, covering much of the relevant literature.

REDDICK (D.) & CROSIER (W.). **Biological specialization in Phytophthora infestans.**—*Amer. Potato Journ.*, x, 7, pp. 129–134, 1933.

A comparative study of *Phytophthora infestans* from Californian and New York tomatoes and New York potatoes failed to reveal any morphological or physiological differences on inoculation into Bonny Best, Ponderosa, and Yellow Globe tomatoes, and Evergreen and Russet Rural potatoes. Both on tomatoes and potatoes the Californian isolation produced more virulent symptoms, but this character, being purely temporary, is not considered to afford evidence of biologic specialization [*R.A.M.*, xii, p. 465]. It is possible that the varieties of tomatoes and potatoes at present under cultivation in North America are not adapted to disclose the existence of more than one form of the parasite. Comparative tests made at the writers' request by Miss Yatzenina in Russia in 1928, and by Dr. K. Böning in Germany in 1930, showed that the forms of the fungus occurring in those countries were identical with the American. The newly reported German biotype [loc. cit.] may either have arisen from oospores or merely been brought into prominence by a hybrid possessing *Solanum demissum* 'blood'. The new form was found at Streckenthin on hybrids of K. O. Müller's 'W' (Washington) race, the original material of which was supplied by W. Stuart. Müller has stated that the origin of the 'W' wild immune plant is not certainly known, but he believed it to have come in the first instance from Chile. However, the similarity between the reaction of the 'W' hybrids and Schick's *S. demissum* plants to *P. infestans*, the late maturing habit of the 'W' race, and the fact that no blight-resistant potato has hitherto been obtained from Chile, make it practically certain that Müller's wild plant is one of the many forms of *S. demissum*, a species

unknown outside Central Mexico. Stuart's collection is known to include Mexican as well as South American material.

SCHMIDT (E.). **Unsere Erfahrungen bei der Züchtung phytophthoraresistenter Kartoffeln.** [Our experiences in the breeding of *Phytophthora*-resistant Potatoes.]—*Der Züchter*, v, 8, pp. 173–179, 1933.

In 1925 a number of tubers of the so-called 'SW' potato strain were supplied by the Biological Institute, Berlin-Dahlem, to the v. Kameke seed selection establishment at Streckenthin. According to Müller [see preceding abstract], the strain in question is derived from a cross between a semi-cultivated variety used by the South American Chilote Indians and Dolkowski's Svitez. An exceptional degree of resistance to *Phytophthora infestans* was reported by Vowinckel and Müller to be shown by this strain in field trials, but from 1925 onwards it regularly developed infection at Streckenthin, the incidence approximating to that of the medium-late cultivated varieties. Subsequent inoculation experiments with a zoospore suspension of the fungus on plants raised from tubers confirmed the susceptibility of SW, among 5,000 seedlings of which, moreover, there was not a single resistant individual.

In 1926 the Streckenthin station further received tubers of two strains resulting from a cross between the so-called 'Ef' and Polanin, the former originating in a miscellaneous consignment of wild potatoes from America. Following protracted inbreeding, the best lines of these strains (which are known as Ef strains and which maintained complete freedom from late blight and showed no trace of mycelial infection on the leaves up to 1931) were crossed with certain standard varieties and the following figures obtained: Ef × Pepo, 321 susceptible and 344 resistant = 52 per cent. resistant; Ef × Centifolia, 274 susceptible and 267 resistant = 49 per cent. resistant; Ef × Alma, 120 susceptible and 121 resistant = 50 per cent. resistant. As early as 1927 hybridization was initiated between the resistant F_1 strains with Ef parentage and standard varieties, and by 1932 there were 167,336 seedlings of the F_1 to F_4 generations, i.e. originating from strains crossed once to four times with commercial sorts. No close correlation was detected between resistance to *P. infestans* and the undesirable qualities of Ef, e.g. stunted habit of growth and delayed maturity, and a considerable number of the above-mentioned hybrid seedlings gave very promising indications of a suitable blend of characters. At this juncture, however, a set-back occurred in the form of a severe attack of late blight, to which the entire progeny of the Ef crosses, as well as the Ef strains themselves, had succumbed by the end of August 1932. There was, however, some indication of a capacity on the part of certain hybrids of the early type to impede the development of the fungus.

In the writer's opinion, the abrupt loss of resistance in the Ef progeny is attributable to the equally sudden development at or about the same time of the 'Streckenthin biotype' of *P. infestans*, most probably the outcome of mutation induced by special environmental factors [ibid., xii, p. 465], evidence against the possibility that it was introduced from abroad, or had been long present but

masked by the absence of preferential hosts, being briefly summarized.

The crossing of the American strains with cultivated European varieties presents no great difficulties, especially when the resistant Central American wild *Solanum demissum* is used as the female parent. In certain cases successful hybridization was also effected by the use of this strain as the male parent, the F_1 being relatively uniform and intermediate in type and up to the present showing 100 per cent. resistance to *P. infestans*, including the Streckenthin strain.

McCall (T. M.). **Depth of planting experiments for the control of Rhizoctonia on Potatoes.**—*Proc. Amer. Soc. Hort. Sci. 1932*, xxix, pp. 413–414, 1933.

In 1930 a series of experiments was initiated at the Maine Northwest Experiment Station to determine the relation of planting depth to the infection of Triumph potato tubers by *Rhizoctonia* (*Corticium vagum*) [*C. solani*: *R.A.M.*, x, p. 12]. It was evident from the results of these tests that covering the seed pieces to a depth of 6 in. caused a heavy increase of infection (up to 90 per cent. compared with 30 per cent. at 1 to 2 in.). Even seed tubers treated with the standard seed disinfectants showed 75 per cent. infection at 6 in. The yield from the untreated seed at 1 to 2 in. averaged 200 bushels per acre, decreasing to 150 at 6 in. The percentages of infection among the treated seed ranged from 50 at 1 to 2 in. to 66 at 6 in., at which depth and at 4 in. the excess yield of treated over untreated material ranged from 10 to 15 per cent.

Goossens (J.). **Alternaria-dróogrot van Aardappelknollen.** [*Alternaria* dry rot of Potato tubers.]—*Tijdschr. over Plantenziekten*, xxxix, 7, pp. 165–172, 2 pl., 1933.

During the winter of 1932–3 the Dutch Phytopathological Service received a number of reports on the damage (up to 25 per cent. of the crop) caused by *Alternaria solani* to tubers of the Bintjes, Eerstelingen [Duke of York], and Eigenheimer potato varieties [*R.A.M.*, ix, pp. 335, 435]. The symptoms of the dry rot of the tubers, an unfamiliar development in Holland, where the leaf blight caused by this fungus is better known [ibid., iv, p. 61], are briefly described, and observations are made on the life-history of the fungus and the factors affecting its occurrence, in the light of recent studies. The writer's inoculation experiments were uniformly successful when fragments of mycelium from agar cultures were applied to wounded tubers, whereas similar tests with spores generally gave negative results. On Bintjes the resulting lesions were much more extensive than on Duke of York. Control measures are briefly indicated.

Riccardo (S.). **La cancrena secca delle Patate per fusariosi in provincia di Napoli.** [*Fusarium* dry rot of the Potato in the province of Naples.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, Portici, ii, pp. 1–16, 2 pl., 1 fig., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, p. 324, 1933.]

Potatoes stored in pits in the province of Naples are stated to

be frequently subject to a dry rot associated with a species of *Fusarium* which in its morphological and cultural characters entirely agrees with *F. oxysporum*. It is not unlikely that the fungus is disseminated by acarids (especially *Rhizoglyphus echinopus*), which are always present in large numbers on the diseased tubers. It is suggested that the rot might be avoided by storing the potatoes in conical heaps on platforms of well-beaten earth, instead of in pits, and covering them with straw instead of with the dry potato haulms, as is the present usage in the locality.

CAROLUS (R. L.). **Some significant variations in the chemical composition of the plant associated with a malnutrition trouble of Potatoes.**—*Amer. Potato Journ.*, x, 8, pp. 147–165, 1933.

A fully tabulated account is given of the writer's investigations on the magnesium deficiency disease of potatoes recently described from Virginia [*R.A.M.*, xii, p. 654]. It was found that a 60-barrel crop of tubers removes from the soil 3 to 4 lb. of magnesium. Therefore this amount should be included in the fertilizer mixture used in periods of heavy rainfall on light soils with a tendency to leaching. Chucka (*Better Crops with Plant Food*, Feb.–March, 1932) reports increases up to 155 bushels per acre on certain Maine soils treated with 300 lb. $MgSO_4.7H_2O$ per acre. Plant analyses have shown that even small amounts of lime increase magnesium absorption. On acid soils the addition of magnesium limestone, in quantities sufficient to induce a reaction of at least P_H 5, supplemented with magnesium sulphate during the adjustments of the soil to the increased calcium content, should effect an appropriate balance and improve plant growth.

ITO (S.) & TOKUNAGA (Y.). **Studies on the rot-disease of Rice-seedlings caused by Pythium-species.**—*Journ. Fac. Agric., Hokkaido Imper. Univ.*, xxxii, 5, pp. 201–233, 5 pl., 1933.

Five species of *Pythium* were isolated from rotted rice seedlings in Hokkaido and Honshu, Japan, and are described in detail, namely, *P. oryzae* n. sp., *P. nagaii* n. sp., *P. echinocarpum* n. sp. [all furnished with Latin diagnoses], *P. monospermum* Pringsh. [*R.A.M.*, x, p. 211], and a hitherto unidentified species.

P. oryzae is characterized by hyphae measuring 1·8 to 4·2 μ (average 2·8 μ) with numerous bud-like outgrowths up to 10 μ in breadth. The sporangia are filamentous, about 3 μ in breadth, and the terminal or intercalary, spheroidal, smooth oogonia, are 15 to 23 μ in diameter, with one or two curved, clavate or oblong antheridia. The spherical, smooth, granular oospores measure 12 to 20 μ in diameter and usually contain a large oil drop, the wall being 2·5 to 3 μ thick.

P. nagaii has hyphae 1·5 to 4 μ (average 2·5 μ) in breadth, at the tips of which are produced ovoid, piriform, or rarely spherical, proliferous sporangia, 24 to 36 by 20 to 26 μ. The zoospores measure 12 by 7·2 μ (8·2 to 9·6 μ when encysted). Germination also takes place by means of a germ-tube from the apex of the

sporangium. The spheroidal to irregular, smooth oogonia, 14 to 22 μ in diameter, have a single ovoid, globoid, or clavate antheridium. The spherical, smooth, guttulate oospores measure 12 to 19 μ in diameter, their pale to dark yellow wall being less than 0·8 μ in width.

The hyphae of *P. echinocarpum* measure 1·2 to 4·8 μ (average 3 μ) in diameter; sporangia and zoospores have not been observed. The terminal or intercalary, spheroidal, echinulate oogonia measure 15 to 24 μ without the spines, the latter being 4 to 9 μ long and 1·5 μ wide at the base. The clavate or oblong, mostly curved antheridia are sometimes hypogynal (formed by segmentation in the oogonial branch). The spherical, smooth, globular oospores, 13 to 21 μ in diameter, with walls 0·8 to 1·2 μ thick, almost entirely fill the cavity, unlike those of the two preceding species.

The undetermined species resembles *P. oryzae* in its general morphology, but so far no sexual organs have been observed.

On rice-grain decoction agar *P. monospermum* grew best at 28° to 32° C. and all the others at 24° to 28°; the former alone continued to develop at 35°. The thermal death points were determined as follows: *P. monospermum*, 50 minutes at 45°; *P. oryzae*, 60 minutes at 40° or 24 at 45°; *P. nagaii*, 20 minutes at 45°; *P. echinocarpum*, 50 minutes at 45°; and *P.* sp., 60 minutes at 40° or 10 at 45°. All the species grew fairly well at 10°. The fungi made good growth on transference from a temperature of 25° to 13°, and from 15° to 25°. No zoospores were produced at 30°, whereas oogonial formation was more abundant at the higher temperature ranges.

All five species were proved by inoculation experiments to be pathogenic to rice-grains (Bozu variety). *P. echinocarpum* was the most virulent (86 per cent. infection on soil at 15° to 26°) and *P. monospermum* the least. The greatest injury is caused at relatively low temperatures. Rice-grains deprived of their seed coats were much more susceptible to *Pythium* infection than those with hulls. The percentages of infection were found to decrease with the age of the plants, those inoculated a week after sowing being scarcely affected. The growth reduction due to *Pythium* infection was most pronounced in the Akage variety at 15° to 20°.

In infected seeds the embryo turns dark brown and the diseased endosperm tissues also become discoloured, while the plumule and radicles are eventually involved. As infection proceeds the leaves and culms turn yellowish-white and the culm bases brownish.

BATESON (E.). **Rubber in North Borneo. Annual Report of the Mycologist and Agricultural Adviser for 1932.**—*Bull. Rubber Growers' Assoc.*, xv, 6, pp. 323–325, 1933.

Heavy infection of *Hevea* rubber by *Fomes lignosus* is very rare in North Borneo, but the disease is spreading, as are, though more slowly, *F. pseudoferreus* [*Ganoderma pseudoferreum*] and *Ustulina zonata* [cf. *R.A.M.*, vi, p. 750]. Estate managers now realize the importance of promptitude when dealing with outbreaks of pink disease [*Corticium salmonicolor*]. *Oidium* [*heveae*] has not so far been recorded in the State.

BRANDENBURG (E.). **Onderzoekingen over ontginningsziekte, II.** [Investigations on reclamation disease, II.]—*Tijdschr. over Plantenziekten*, xxxix, 8, pp. 189–192, 1 pl., 1933.

Continuing his investigations on the reclamation disease of oats [*R.A.M.*, x, p. 487], the writer tested the effect of the addition of 0·2 mg. of copper sulphate to plants in a nutrient solution (P_H 5·5 to 6·5), containing 0·5 gm. each of potassium nitrate, calcium phosphate, and magnesium sulphate, 0·2 gm. of ammonium nitrate, 0·36 gm. potassium chloride, 0·175 gm. ferri-ammonium sulphate, 0·5 gm. each of boric acid, zinc sulphate, and aluminium sulphate, 1 to 2 mg. of manganese sulphate, and 25 to 30 mg. of potassium silicate per l. of water.

Some four weeks after the commencement of the test, i.e., about the end of May, the plants receiving copper were in a completely healthy state and had attained normal development (110 cm. in height), whereas those without copper showed a white spotting of the young foliage, sometimes accompanied by a rolling of the leaves along the midribs and a yellowish-white discoloration of the margins. The youngest leaf in all the affected plants died, and growth ceased at a height of 20 cm. The lateral shoots profusely developed by the plants without copper also showed white spots and eventually died. The symptoms thus experimentally induced correspond exactly with those of the reclamation disease as it occurs in nature on sandy humus soils. In further tests the addition of even 0·05 mg. copper sulphate was shown to exercise a preventive action on the disease, which would thus appear to be due to the absence of copper from the soil.

The *Pythium* infection of beets [see above, p. 10], formerly believed to stand in some relation to reclamation disease, has not proved amenable to copper sulphate treatment and is thus apparently of independent origin.

SCHWARTZ (G.). **Entseuchung von Anzuchterde und Erdhaufen durch Dampf.** [The disinfection of propagating soil and soil heaps by steam.]—*Obst- und Gemüsebau*, lxxix, 7, pp. 104–105, 4 figs., 1933.

A method of soil disinfection by steam is described [*R.A.M.*, xii, p. 460], in which the heat is supplied by a system of pipes from an Akyra low pressure boiler to a tipping-cart containing ⅔ cu. m. of moderately dry soil. The steam is admitted to the cart until the thermometer affixed to the lid of the latter registers 96° C. The process of sterilization takes about 40 minutes, so that in a ten-hour working day some 10 cu. m. can be treated. Notes are also given on a simple method of sterilizing small quantities of soil by steam in a washing-copper.

BOURIQUET (G.). **Les maladies du Vanillier à Madagascar.** [Diseases of Vanilla in Madagascar.]—*Ann. de Cryptog. Exot.*, vi, 1, pp. 59–78, 6 pl., 1 fig., 1933.

A brief account is given of the more important physiological troubles and parasitic diseases of vanilla so far recorded in Madagascar [cf. *R.A.M.*, xi, p. 699]. Besides *Calospora* [*Botryosphaeria*] *vanillae*, in the east of the island anthracnose of the stem, leaves,

and occasionally of the pods was found to be caused by a fungus very similar to, if not identical with, *Glomerella vanillae* [ibid., vi, p. 695]. An anthracnose of the pods was also observed in association with an unidentified species of *Gloeosporium*. The other diseases briefly described include a pod rot developing from either end of the unripe fruit and finally extending to the whole of the latter. The parts attacked assume a chocolate-brown colour, frequently in the form of more or less extensive spots on an almost normal green ground, and often covered with a slight white efflorescence of the conidia of the causal fungus. The portions underlying the spots become less turgid and are longitudinally wrinkled, and the affected pods easily drop off. The fungus closely resembled, both in nature and in pure culture, the species reported by Maublanc and Barat from Réunion, which they considered to be *Phytophthora jatrophae* [*P. parasitica*: ibid., vii, p. 600; cf. also ix, p. 767]. Its pathogenicity was established by the authors, successful infections being produced by inoculation into vanilla pods and stems, and also into the fruits of the Barbados nut (*Jatropha curcas*) in the laboratory. Mention is also made of a root rot caused by *Fusarium batatatis* var. *vanillae* [ibid., vii, p. 669], and various non-parasitic diseases comprising chlorosis, a necrosis of stems and leaves, and a degeneration, the most marked symptom of which is a noticeable reduction in the raw weight of the pods. Control measures are indicated in the case of most of the troubles dealt with.

Varietal introductions in Puerto Rico and the Philippines.—*Internat. Sugar Journ.*, xxxv, 415, pp. 257–258, 1933.

In this brief review [the first part of which is based on a lecture by C. E. Chardon and the second on a paper by J. J. Mirasol] of the effects on yield of changes in the sugar-cane varieties grown in Porto Rico and the Philippines it is stated that in the former island, where mosaic first appeared in 1915 and by 1918 had spread over three-quarters of the sugar-cane area, the average annual yield for the seven years following 1925 (when the change to Uba and BH 10 (12) first began to take effect) was nearly 70 per cent. higher than that for the ten years before 1925, though the corresponding increase in acreage was barely 10 per cent. In 1917, when mosaic was not a serious factor, the yield in one locality was 16·24 tons, which fell as a consequence of the disease to 12·40 tons in 1921; in that year Uba was planted, with the result that by 1924 the yield had risen to 29·84 tons. Between 1915 and 1924 the loss from mosaic in Porto Rico amounted, at a conservative estimate, to 8 or 10 million dollars. Uba retained its popularity till 1927, but at present B.H. 10 (12) occupies a large acreage in the south coast region. In the mosaic-infected western districts and in poor and hilly lands P.O.J. 2725 has given superior yields to B.H. 10 (12) and is highly resistant to mosaic.

In the Philippine Islands the commercially mosaic-immune P.O.J. 2878 was first grown on an extended scale in 1929; in 1932 it was already third in respect to total yield and it is expected in the next two years to become the most widely grown variety.

D'EMMEREZ DE CHARMOY (D.) & GUÉZÉ (P.). **Situation actuelle de la mosaïque à la Réunion.** [Present situation of mosaic in Réunion.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiii, 143, pp. 495–499, 1933.

This paper advocates the introduction in Réunion of special legislation [a brief outline of which is given] for the purpose of checking the further spread of sugar-cane mosaic in the island [cf. *R.A.M.*, xii, p. 427]. As a first step the authors suggest subdividing the cane-bearing areas into three categories according to the prevalence and intensity of the disease, judged by its effect on the M. 131 cane which is stated to be the most susceptible and most widely grown variety in Réunion. The first two categories should include the areas where mosaic is already firmly established, and those threatened in the near future, while the third should comprise the estates where mosaic is more or less sporadic either naturally or owing to the control measures already introduced. Briefly stated, the measures proposed consist of the compulsory eradication of the most susceptible cane varieties in the first two categories, and in the prohibition of varieties of sugar-cane for the reconstitution of the plantations, other than those supplied or recommended by the competent agricultural authorities.

PRIODE (C. N.). **Cuban streak.**—*Phytopath.*, xxiii, 8, pp. 674–676, 1 fig., 1933.

An apparently new disease of P.O.J. 2725 and C.A.C. 323 sugar-cane, designated 'Cuban streak' and tentatively attributed to a virus, was observed in the autumn of 1931 at the Tropical Plant Research Foundation experimental plots, Central Jatibonico, Cuba. The symptoms take the form of interrupted, chlorotic-white to brick-red stripes following the leaf veins and mostly extending the whole length of the leaf, the stalks of the affected plants being abnormally small. The streaked plants were growing in a field surrounded by canes with a high percentage of mosaic from which the new disease, however, is evidently distinct. The 'Cuban streak' symptoms also differ from those of maize stripe [*R.A.M.*, xii, p. 756], and all attempts to transmit the latter to cane have been unsuccessful. The symptoms of the new disease and South African streak of sugar-cane [ibid., xii, p. 658] are not similar and the insect vector of the latter [*Cicadulina mbila*] is not known in Cuba.

PRIODE (C. N.). **Two hosts of the pokkah-boeng disease other than Sugar-cane.**—*Phytopath.*, xxiii, 8, pp. 672–673, 1 fig., 1933.

Young maize plants were observed in Cuba to be affected by a chlorotic condition of the leaf bases with red and black markings, sometimes accompanied by a malodorous rot and distortion of the tops and almost always by lesions on the surface of the stalk but not within it. A *Fusarium* resembling that associated with pokkah-boeng of sugar-cane [*Gibberella moniliformis*: *R.A.M.*, xii, p. 679] was isolated from the diseased tissues. Similar symptoms were shortly afterwards observed on sorghum, which showed the red markings in a more pronounced form than the maize;

where these areas dry and fall out the appearance of the plants recalls that of sugar-canes attacked by *G. moniliformis*. The fungus isolated from maize and sorghum was inoculated into the same hosts and sugar-cane with positive results, the symptoms on the last-named being typical of pokkah-boeng. Conversely, pure cultures of *G. moniliformis* from sugar-cane produced the above-mentioned symptoms on maize and sorghum.

COOK (W. R. I.). **A monograph of the Plasmodiophorales.**—*Arch. für Protistenkunde*, lxxx, 2, pp. 179–254, 11 pl., 12 figs., 2 diags., 1933.

This is an extended account of the writer's critical and taxonomic studies of the Plasmodiophorales, a summary of which has already been noticed from another source [*R.A.M.*, xii, p. 468]. The species discussed in this treatise are *Plasmodiophora brassicae*, *P. ficirepentis* [ibid., x, p. 4], *P. diplantherae*, *Sorosphaera veronicae*, *S. radicalis* Cook & Schwartz, *Sorodiscus callitrichis*, *S. radicicolus* Cook, *S. karlingii* sp. nov., *Spongospora subterranea*, *S. campanulae*, *Tetramyxa parasitica*, *T. triglochinis*, *Ligniera junci*, and *L. verrucosa* [ibid., vii, p. 744]. Other sections deal with genera excluded from the Plasmodiophoraceae and those incorporated in the recognized genera; the phylogeny of the Plasmodiophoraceae; and the relationships of the Plasmodiophoraceae with the Protozoa, Mycetozoa, and Chytridiales, respectively.

A five-page bibliography and a glossary of technical terms are appended.

BUISMAN (CHRISTINE). **Über die Biologie und den Parasitismus der Gattung Ceratostomella Sacc.** [On the biology and parasitism of the genus *Ceratostomella* Sacc.]—*Phytopath. Zeitschr.*, vi, 4, pp. 429–439, 1933.

A survey is given of recent literature [all of which has been noticed in this *Review*] on the biology and parasitism of *Ceratostomella* spp. under the headings of: (1) the occurrence of heterothallism in *Ceratostomella*, (2) parasitism in the genus *Ceratostomella*, and (3) the relationship between *C.* spp. and wood-borers [cf. *R.A.M.*, xii, pp. 409, 650, 665 *et passim*].

BURNS (W. E.). **The taxonomic position of an aroma-producing mold.**—*Iowa State Coll. Journ. of Science*, vii, 4, pp. 433–437, 2 pl., 1 fig., 1933.

Morphological and cultural studies [details of which are given] on a mould producing a peculiar fruity aroma isolated by Dr. M. Levine from maize mash indicated that the organism agrees with *Oidium suaveolens*, described by A. Krzemecki (*Centralbl. für Bakt.*, Ab. 2, xxxviii, p. 577, 1913). The genus *Oidium* is restricted in modern usage to plant parasites known to represent the conidial stages of Erysiphaceae, and cannot, therefore, include the saprophytic mould under observation. C. Berkhout reclassified the latter in 1923 as *Oospora fragrans* [cf. *R.A.M.*, iii, p. 556], the change in the specific name being necessary because there was already an *O. suaveolens* (Lindner) Lindau. The greater suitability of the genus *Cylindrium* for organisms with cylindrical conidia

of this type was apparently overlooked. The adoption of the new combination *C. suaveolens* for the aromatic mould is proposed.

QUANJER (H. M.). **Über eine komplexe Viruskrankheit des Tabaks.** [On a complex virus disease of Tobacco.]—*Phytopath. Zeitschr.*, vi, 4, pp. 325–333, 2 figs., 1933.

In continuation of the author's study with K. Silberschmidt of the effects of inoculating tomato plants with two kinds of virus, namely, ordinary tobacco mosaic and acronecrosis from outwardly healthy Magdeburger Blaue potatoes [*R.A.M.*, xi, p. 808], similar tests were carried out in 1932 at Wageningen, Holland, on Amersfoort tobacco plants, which were inoculated by rubbing the leaves (*a*) with each of these components separately, and (*b*) with a mixture of both.

The plants inoculated only with tobacco mosaic developed the well-known symptoms of this disease after a fortnight. Those inoculated with the expressed sap of Magdeburger Blaue potatoes showed in two to three weeks numerous small, circular spots constituting a transitional stage between 'mottle' and 'ring spot' [ibid., v, p. 119; xii, p. 473]. Plants inoculated with a mixture of the mosaic and acronecrotic viruses at first developed the typical mosaic symptoms, then those of the ring spot, and later a necrosis of the base of the midrib of the older leaves and neighbouring parts of the stem, a condition resembling Schaffnit's and Müller's description of streak necrosis [ibid., x, p. 537]. Their description may be supplemented by the following points. A faint, striate, shiny swelling of the cortex is the incipient stage of the brown stripes on the stems. The uppermost foliage also shows the characteristic symptoms of mosaic, while in some cases the upper halves of the leaves developed mottling and the lower ones necrosis. In order, however, to obtain complete certainty as to the identity of streak necrosis it is necessary to repeat the synthesis in the locality of the spontaneous occurrence of the disease, and further to analyse the components (1) by separating the tobacco mosaic virus from the mixture by ten minutes' exposure to a temperature of 80° C.; (2) by separating the potato virus from the mixture by passage through *Datura stramonium*; and (3) by separating the first components from the apical leaves of tobacco as soon as the early symptoms of mosaic appear.

A brief summary is given of recent literature on the viruses under discussion.

MOORE (E[NID] S.) & SMITH (A. J.). **Control of pests and diseases in Tobacco seedbeds.**—*Farming in South Africa*, viii, 89, pp. 305–306, 1 fig., 1933.

Directions are given in popular terms for the control of tobacco seedling diseases by the use of clean seed, the choice of suitable sites for seed-beds, their preparation, sowing, and care, seed disinfection, and spraying. The yellow varieties, such as Burley and Sterling, are stated to be the most susceptible to disease, especially damping-off [*Pythium de Baryanum*, *Corticium solani*, and other fungi] and wilt [*Fusarium oxysporum* var. *nicotianae*], and should not be grown where trouble from these is anticipated.

SAMUEL (G.), BALD (J. G.), & EARDLEY (C. M.). **'Big bud', a virus disease of the Tomato.**—*Phytopath.*, xxiii, 8, pp. 641–653, 5 figs., 1933.

'Big bud' of tomatoes, originally named 'rosette' by N. A. Cobb (*Agric. Gaz. New South Wales*, xiii, p. 410, 1902), occurs in all parts of Australia, being most prevalent, however, in New South Wales and Victoria. Usually only a very small percentage of plants is affected, scattered at random over the field. In South Australia, no case of more than 5 per cent. infection has been observed over a ten-year-period, but 50 to 100 per cent. infection has been noted in New South Wales. Big bud is most prevalent in mid- and late summer (January-February).

The first sign of infection appears at the tips of actively growing shoots. The youngest fruit truss and its buds assume an upright position, and the calyx enlarges to a bladder-like body with a toothed aperture at the top. The calyx veins, the under sides of the young leaves, and the youngest part of the stem often show a purple colouring (anthocyanin). The axillary buds form shoots affected similarly to the main shoots, while the diseased stems show a gradual thickening (up to 1½ or 2½ cm.) due to abnormal tissue formation in close association with the internal phloem. Adventitious root initials break through the epidermis, and longitudinal fissures may appear, exposing the internal tissue in characteristic scars. Unpruned plants acquire a very tufted, rosette-like form of growth due to the development of numerous lateral shoots and axillary buds, and to floral proliferation. The formation of small, lateral leaflets from the main and secondary petioles is stimulated, and there may be some upward rolling of the leaf margins. The youngest leaves turn yellowish-green, usually purple underneath, and as the disease progresses the leaves become continuously smaller until finally they may be only 1 to 2 cm. long. The corolla of the opening flowers may become stunted or enlarged and completely virescent, accompanied in either case by cessation of growth of anthers and ovary. The gynoecium may be carried up 1 to 2 cm. on the proliferation of the central floral axis, and in such cases there is usually distinct phyllody of the carpels, but sometimes the proliferating branches terminate in a second series of affected flower buds; the short, dichotomously branching apical shoots bear minute, hyaline papillae (apparently homologous with ovules), intermingled with a few small leaf rudiments, and are usually strongly coloured with anthocyanin. Fruit already set when invaded by the virus is immediately arrested in growth, whereas in very young fruit there may be very slow development of the placental tissues, bursting the thin ovary walls. Adventitious shoots may arise from any part of the pedicels or placental tissue, and even from between the arrested ovary and the calyx. Fruit still green at the time of infection becomes hard and tough and colours slowly if at all. In younger fruit there may be a necrosis of the embryo centres, which are embedded in a firm parenchymatous tissue with thick cellulose walls.

A greenish, water-soaked tissue develops in connexion with the internal phloem in the diseased portions of the stem and in fruit trusses, petioles, and midribs. The bulk of the abnormal tissue

consists of small cells with prominent nuclei, sieve-tubes being rare and isolated tracheids present. The tissue arises first in scattered groups, resulting from the division of separate pith cells, and increases to a continuous band. The presence of the adventitious tissue is accompanied by extensive starch formation.

Big bud was readily transmitted from diseased to healthy tomatoes by budding and grafting, the incubation period ranging from 28 to 56 days. Attempts to infect tobacco and *Nicotiana glutinosa* failed. Field plants of *Solanum nigrum* showed some typical features of big bud, including dwarfing of the foliage, numerous axillary shoots, the replacement of the flowering trusses by short branches with terminal papillae, and the production of adventitious internal phloem. The parallelism, as regards effect on the host, between big bud and false blossom of cranberry [see above, p. 41] is noted.

La maladie du fil. [Thread disease.]—*Direct. Gén. Agric., Comm. et Colon., Service Défense Végét., Mém.* 10, 5 pp., 2 pl., 1933.

Notes are given in popular terms on the symptoms, mode of dissemination, and control of the 'thread' disease of tomatoes (so called by reason of the slender, dark brown lines running along the vascular bundles of the stem) due to *Bacterium solanacearum* in Morocco.

DUFRÉNOY [J.]. **Reconstitution par les Châtaigniers japonais des Châtaigneraies détruites par la maladie de l'encre.** [The regeneration by Japanese Chestnuts of the Chestnut groves destroyed by the ink disease.]—*Congr. Morbihan. de la Forêt et du Châtaignier, 1932*, pp. 56–63, 7 figs., [? 1933].

To the best of the author's belief, not a single one of the thousands of Japanese chestnuts planted during the last ten years in Limousin has succumbed to the ink disease (*Phytophthora cambivora*) [*R.A.M.*, ix, p. 72], and inoculation tests at the Migoule (Brive) experimental plantation gave almost completely negative results on these varieties, while killing most of the indigenous trees. Laboratory experiments have shown that the resistance of the Japanese chestnuts is due to the rapid production of phenolic compounds in the cortical cells threatened by the fungus [ibid., xi, p. 391]. The symptoms and etiology of the ink disease are briefly described, and notes are given on the characteristics and requirements of the Japanese chestnuts.

Statutory Rules and Orders, 1933, No. 1011. Destructive Insect and Pest, England. The Importation of Elm Trees and Conifers (Prohibition) Order of 1933. Dated October 24, 1933.—2 pp., 1933.

The Importation of Elm Trees and Conifers (Prohibition) Order of 1933, effective from 1st December, 1933, prohibits the landing in England or Wales from any country other than the rest of the British Isles, of any living plants of *Abies, Larix, Picea, Pinus, Pseudotsuga, Sequoia, Thuja*, and *Tsuga*. The importation of living elm trees from any European country has been prohibited since 1927 [with a view to the exclusion of *Ceratostomella ulmi*,

the agent of the 'elm disease': *R.A.M.*, vi, p. 384]. This Order is now revoked, but its provisions have been incorporated in the new Order and extended to elm trees from all countries outside the British Isles. The new Order further requires that the health certificates prescribed under the Importation of Plants Order of 1933 [ibid., xii, p. 799] to accompany living plants imported from abroad must contain a statement vouching for the absence from the consignment of any of the prohibited genera.

[Similar regulations are prescribed for Scotland.]

Notice of Quarantine No. 70 on account of the Dutch Elm disease. —*U.S. Dept. of Agric. Office of Inform. Press Service*, 4 pp., 1933. [Mimeographed.]

The recent outbreak in New Jersey of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xii, p. 794] was immediately followed by the discovery of the fungus in elm burl logs imported from Europe in which also were found the bark beetles (*Scolytus* spp.) concerned in its dissemination. As a result Quarantine No. 70, effective as from 21st October, 1933, was imposed and prohibits the importation from Europe of (*a*) seeds, leaves, plants, cuttings, and scions of elm or related plants of all genera of the Ulmaceae; (*b*) logs, lumber, timber, or veneer of such plants if bark is present on them; and (*c*) crates, boxes, barrels, packing cases and similar articles manufactured wholly or in part of the wood of these plants if such wood is not free from bark. Logs from which the bark has been removed may be imported from Europe only under a permit from the Secretary of Agriculture, to whom immediate notice of their arrival must be given; within 20 days of receipt and before the removal of any waste or trimming, the logs must be treated, under official supervision, with hot water or steam in such a way as to subject the whole interior of each log to a temperature of not less than 180° F. for at least two hours, or by some other approved method, failing which arrangements will be made for the removal of the consignment from the country or its destruction. Should inspection disclose the presence of the above-mentioned insects, indicate improper storage pending treatment, or give rise to the suspicion of risks of spreading the disease or its insect vectors, the permittee shall be notified and adequate safeguards prescribed, neglect of which will involve the seizure and disposal of the logs or the suspected portions thereof at the discretion of the authorities.

Importation of Citrus trees and products.—*Farming in South Africa*, viii, 89, p. 316, 1933.

Proclamation No. 139 of 1933 of the Plant Regulatory Service, Division of Plant Industry, Union of South Africa, extends the prohibition on the importation of all kinds of citrus trees, fruit, scions, cuttings, bark, peel (exclusive of candied material), and leaves to the whole of Portuguese East Africa on account of the risk of introduction of canker [*Pseudomonas citri*: *R.A.M.*, xii, p. 463. This disease has recently been found to occur in Mozambique Territory].

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PRETI (G.). **Marciume del Pomidoro nella Liguria occidentale 'Solanum lycopersicum'.** [Rot of the Tomato '*Solanum lycopersicum*' in western Liguria.]—*Riv. Pat. Veg.*, xxiii, 7-8, pp. 291–301, 4 figs., 1933.

The author gives a brief account of a severe outbreak of early blight (*Alternaria solani*) on the basal parts of tomato plants in the province of Savona, an important contributory factor to which is stated to have been the nature of the local clay soils, which tend to retain a high degree of moisture after irrigation. The attack was most marked in the region of the collar, which was more or less completely disorganized and blackened. Some recommendations are made for the control of the disease.

ALLAIN (A.). **Contribution à l'étude du Phytophthora cambivora.** [A contribution to the study of *Phytophthora cambivora*.]—*Comptes rendus Soc. de Biol.*, xciii, 28, pp. 1405–1407, 4 figs., 1933.

The writer has studied the morphology and cytoplasmic characters of *Phytophthora cambivora* [*R.A.M.*, xii, p. 337], the agent of ink disease of chestnuts, in Corrèze, France. His observations confirm those of previous workers in regard to the general morphology of the fungus.

SERVAZZI (O.). **La disinfestazione delle Castagne d'esportazione con il metodo dell'immersione in acqua a 50° C./45′ in rapporto al problema delle muffe.** [The disinfection of export Chestnuts by immersion in water at 50° C. for 45 minutes in connexion with the problem of moulds.]—Reprinted from *Boll. Lab. Sperim. Fitopat. di Torino*, x, 30 pp., 1933.

This is a summary review of the work done up to 1933 at the Royal Phytopathological Observatory of Turin for the purpose of determining the best methods for pre-shipment treatment of export chestnuts from Piedmont to preserve them from attacks by insects and moulds [*R.A.M.*, viii, p. 614; ix, pp. 6, 142]. The results [which are tabulated], taken in conjunction with the experience reported by Italian exporters and United States consignees, show that the method now almost generally applied in Piedmont of steeping the chestnuts in water at 50° C. for 45

minutes, while effective against the insects, noticeably increases the natural susceptibility of the fruits to infection with moulds, and promotes the development of the latter both outside and inside the nuts. The mould flora involved is extremely varied, but 14 species belonging to 11 genera [an annotated list of which is given] predominate. It was found that drying after treatment, either in the open or under controlled conditions, is not sufficient to check mould development. The addition to the water of different fungicides proved to be either ineffective against the moulds or to affect adversely the quality and flavour of the nuts, with the exception of formaldehyde which proved fungicidal even at a concentration as low as 0·25 per cent. It is recommended, therefore, that before export the chestnuts should be treated by the usual immersion method, but with the addition of 0·50 per cent. formalin to the water.

TROTTER (A.). **Contributi alla patologia del Nocciuolo. I. Il seccume dei fusti da Cytospora.** [Contributions to the pathology of the Hazel Nut. I. The drying-up of the stems caused by *Cytospora*.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, Portici, ii, pp. 17–27, 3 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, pp. 324–325, 1933.]

The author studied a die-back of the stems of hazel nut [*Corylus avellana*] trees in Naples, leading to many of the stems being broken off at the lowest part of the lesion. This disease is stated to have been described by Savastano as 'disgelatura traumatica' [traumatic frost injury], and to be identical with that known in Catalonia under the name 'sol-cuit' [sun scorched]. Isolations from the diseased tissues yielded a species of *Cytospora* entirely different from that which is always present as a saprophyte on the nuts (*C. corylicola* Sacc.). It is believed that the fungus enters the host tissues through wounds, and that it may be controlled by pruning off and burning all the infected stems, disinfection of the pruning wounds, and by swabbing the dormant stems with iron sulphate solution.

LINDEIJER (EGBERTA J.). **Die Bakterienkrankheit der Weide (verursacht durch Pseudomonas saliciperda n. sp.).** [The bacterial disease of the Willow (caused by *Pseudomonas saliciperda* n. sp.).]—*Phytopath. Zeitschr.*, vi, 4, pp. 371–374, 1933.

The writer's studies on the symptoms, etiology, distribution, and control of the bacterial disease of willows (*Salix alba, S. amygdalina*, and *S. purpurea*) in Holland are briefly recapitulated, with a diagnosis of the causal organism, *Pseudomonas saliciperda* [*R.A.M.*, xii, p. 60].

WALLACE (G. B.). **Tanganyika Territory, Department of Agriculture. Monthly Letter, March, 1933, Annexure 2. Root disease caused by Ustulina.**—3 pp., 1933.

Attention is drawn to the detection, in February, 1933, for the first time in Tanganyika, of the well-known root parasite, *Ustulina zonata*, on the collar and two exposed roots of *Acacia*

campylacantha. The distribution, fructification, symptoms, and control of the fungus are briefly described in popular terms.

STAHEL (G.). **The witchbrooms of Eugenia latifolia Aubl. in Surinam caused by Pseudomonas hypertrophicans n. sp.**— *Phytopath. Zeitschr.*, vi, 4, pp. 441–452, 5 figs., 1 graph, 1933.

Eugenia latifolia, a common tree in Surinam, bears witches' brooms resembling those caused by *Marasmius perniciosus* on cacao [*R.A.M.*, xii, p. 207]. In the early stages the twigs are 1 to 3 times as thick as the normal and grow in an orthotropic direction. The pale young leaves are irregularly curled, the fully grown ones often perforated, and the terminal bud dies prematurely. The lateral and dormant buds of the primary broom grow out to secondary branches, growth continuing for a year or more, unlike the brooms on cacao which die in a few weeks without making any secondary growth.

Shining, jelly-like drops occur in nearly all the intercellular spaces of the tissues of the brooms, particularly in the pith. These contain capsulate bacteria, the capsule being 1½ to 2 μ thick, and also pear- or spindle-shaped involution forms. In the leaf mesophyll large mucilaginous masses are often observed displacing the spongy parenchyma. A few non-capsulate bacteria may be detected in all parts of the embryonic tissue of the young brooms, occurring in single rows and without involution forms.

Sections through the youngest internodes of the witches' brooms showed a marked hyperplasia of the pith, the cortex also being abnormally thick, whereas the xylem was poorly developed. The normal sclerenchyma ring of the deeper part of the cortex is absent in the brooms, the thick, pointed, unicellular hairs on the epidermis of which are unusually numerous. The oil glands in the brooms are radially enlarged as a result of cortical hypertrophy. The thickness of the palisade tissue is reduced from 85 μ in normal leaves to 60 μ in infected ones.

The bacterium of the witches' brooms on *E. latifolia*, which was readily isolated, is a short rod measuring 1·2 to 2·8 by 0·6 to 0·8 μ, with a single polar flagellum, and is generally single though in young cultures rod-shaped chains, 10 to 20 μ or longer, may develop. In freshly isolated colonies small capsules, 0·5 μ in thickness, are formed round the cells, but these disappear on prolonged culture. Typical involution forms developed in saccharose bouillon with 8·6 per cent. sodium chloride. The organism is regarded as a new species of *Pseudomonas* and is named *P. hypertrophicans*. Apparently this is the first record of the production of typical organoid (as opposed to histoid) galls by a bacterium. *P. hypertrophicans* is aerobic, Gram-positive, non-acid-fast, forming circular, slightly raised, whitish, glistening, translucent colonies, with a smell of new bread, on saccharose bouillon agar. No growth occurred on gelatine, steamed bananas, or Uschinsky's solution, and little on neutral bouillon with carbohydrates until after the addition of 2 to 3 per cent. saccharose. Milk was not coagulated or peptonized, and no nitrite, indol, or ammonia was produced, Formic and lactic acids are formed in bouillon with saccharose, dextrose, and fructose. *P. hypertrophicans* is sensitive to desiccation.

being killed within ten hours in a well-aerated room at 80 per cent. atmospheric humidity, and within twelve at 90 per cent. The thermal death points of freshly isolated strains and twelve-week-old cultures of the organism are 48° and 49° C., respectively. The hydrogen-ion growth range on saccharose bouillon is P_H 5·3 to 8·1, development being more profuse towards the acid side.

Witches' brooms were readily produced through needle punctures with agar colonies of the pathogen. If the tissue round the dormant buds is punctured, the latter mostly die; otherwise a mass of very distorted, minute brooms is formed. The inoculation of developing buds results in normal broom production, but should a young, growing internode be punctured, the full-grown twig looks almost normal except for a slight thickening at the point of inoculation. The organism was recovered from a broom produced by inoculation and used successfully in fresh inoculations. Cultures maintained their virulence for at least 105 days. No brooms were produced when bacteria from a young agar culture were smeared on the buds and protected from desiccation by a glass tube. The disease spreads rapidly, probably by means of insects feeding on the sappy brooms and afterwards on the growing internodes of normal twigs.

DAVIS (D.). **Polyporus shoreae (Sal root fungus) in Bahraich Division.**—*Indian Forester*, lix, 8, pp. 507–512, 1933.

The sal (*Shorea robusta*) root-rotting fungus, *Polyporus shoreae* [*R.A.M.*, ii, p. 350], was already present in Bahraich Division [United Provinces] in 1923, and in 1928 it was found to have destroyed a large number of trees over an area of 500 acres, chiefly on low-lying ground. In connexion with the regular work of felling, the dead and dying trees on the affected site were marked in December to January and again in May, 1929, when the total amounted to 1,795, of which between 1,000 and 1,500 are believed to have been directly killed by the fungus. Out of 135 trees bearing sporophores of *P. shoreae* in May, 1929, seven were dead in February, 1933, 25 dying, 31 with sporophores but no other symptoms, and 72 apparently healthy, with no fruit bodies at the base. It is evident, therefore, that *S. robusta* may not die for some year after infection by *P. shoreae*, and it may even survive the attack and recover completely.

VOGLINO (P.). **Sopra un deperimento dell' Araucaria imbricata.** [On a wilt of *Araucaria imbricata*.]—*La Difesa delle Piante*, x, 3, pp. 37–39, 2 figs., 1933.

In the spring of 1933, the leaves of *Araucaria imbricata* trees at Stresa developed a greyish-green or pale brown discoloration, became readily detachable from the branches, and bore punctiform or elongated pustules up to 2 mm. long on both surfaces, but especially the upper, sometimes arranged in lines parallel to the midrib but converging at the base. These bore the perithecia of a *Didymella*, the hyphae of which were blackish-yellow, almost fuliginous, near the perithecia, while those deeper in the disorganized tissues were almost hyaline, and measured 2 to 2·5 μ in diameter.

The blackish or dark brown, globose or piriform, subepidermal

later erumpent perithecia measured 240 to 300 by 240 to 250 μ. The oblong-clavate asci measured 80 to 90 by 4·5 to 6 μ, and contained eight hyaline, elliptical, occasionally subovoidal spores, broadly rounded at the apex, slightly constricted at the only (median) septum, and measuring 9 to 12 by 3 to 4·5 μ (average 10 by 3·5 μ). The paraphyses (one to each ascus) were filiform, hyaline, continuous, simple, and about twice the length of the asci.

The author considers this organism to be a new species, which he names *D. araucariae*. A Latin diagnosis is given.

SCHMITZ (H.). **The toxicity to wood-destroying fungi of coal-tar creosote-petroleum and coal-tar creosote-coal-tar mixtures.** —*Proc. Amer. Wood Preservers' Assoc.*, xxix, pp. 125–139, 2 figs., 1 graph, 1933.

A fully tabulated account is given of the writer's investigations on the comparative toxicity to malt agar cultures of *Fomes annosus* and *Trametes serialis* [*R.A.M.*, xi, p. 758] of three samples of coal-tar creosote, 8387, 8401, and 8403, one of coal-tar (8400), and three of petroleum, 8388, 8402, and 8404.

It is apparent from the resultant data that the initial toxicity of the coal-tar creosote-coal-tar mixtures (50 parts of each by volume) is considerably higher than that of coal-tar creosote-petroleum compounds. For instance, representing as 1 the toxicity to *F. annosus* of creosote 8387, the toxicity of a 50/50 mixture of creosote 8387 and petroleum 8388 would be equivalent to about $\frac{1}{7}$, the corresponding figure when coal tar 8400 was used in place of petroleum being about $\frac{1}{3}$. With a 25/75 mixture the figures were $\frac{1}{24}$ and $\frac{1}{7}$, respectively.

The most toxic of the three samples of creosote was 8387, which killed both fungi at a 0·075 per cent. concentration, while 8401 was the least so (0·35 per cent. for *T. serialis* and 0·45 per cent. for *F. annosus*). The coal-tar sample was only moderately toxic, probably owing in part to its small content of low-boiling fractions, while the three samples of petroleum were essentially non-toxic even at a strength of 10 per cent. About $1\frac{1}{2}$ times as much of the most toxic creosote 8387 in a 50/50 creosote-coal-tar mixture and $2\frac{1}{2}$ times as much in a 25/75 mixture was necessary to kill *T. serialis* as with the undiluted creosote. On the other hand, less creosote 8401 in creosote-coal-tar mixtures was required to destroy *F. annosus* than with undiluted creosote. In the 50/50 coal-tar creosote and petroleum mixtures, nearly four times as much of the highly toxic 8387 was necessary for the destruction of *F. annosus* as with the creosote alone, and six times as much in a 25/75 mixture.

SCHRENK (H. v.). **Significance of toxicity determinations from a practical standpoint.**—*Proc. Amer. Wood Preservers' Assoc.*, xxix, pp. 140–155, 1933.

In the light of current literature and contemporary investigations [which are summarized and discussed], the writer deals with the practical significance in timber preservation of toxicity determinations of creosote and creosote combinations [see preceding abstract]. Attention is drawn to three essential steps in developing

the relationship between toxicity tests and utility in service, namely, (1) uniformity of toximetric determinations, all workers using the same cultural methods and identical strains (not only species) of fungi; (2) the examination, as to distilling points and toxicity, of as many creosote oils as possible from timbers (preferably hardwoods) after a considerable period of service; and (3) the estimation of a correlation between the initial toxicity of the oils and their toxicity after various periods of service.

FLEROV (B. C.) & POPOV (C. A.). **Methode zur Untersuchung der Wirkung von antiseptischen Mitteln auf holzzerstörende Pilze.** [Methods for the investigation of the action of antiseptic preparations on wood-destroying fungi.]—*Angew. Bot.*, xv, 4, pp. 386–406, 3 figs., 1933.

All the current methods of testing timber preservatives are stated to be open to a number of objections. The writers therefore devised the following procedure based as far as possible on natural conditions. A layer of garden soil is placed in an Erlenmeyer flask, and a section of untreated wood (e.g., pine sapwood) laid on it; water is added at the rate of 40 to 50 per cent. of the weight of the soil and a section of wood saturated with the experimental antiseptic placed on top. The flasks should be kept at a temperature of 25° to 27° C. In a test with *Coniophora cerebella* [*C. puteana*] the optimum relative humidity for growth was found to lie between 40 and 50 per cent. This fungus and *Fomes annosus* were selected as the standard organisms for preservative trials in accordance with the recommendations of the Berlin Congress [*R.A.M.*, x, p. 357]. *Merulius lacrymans* should also be included in tests on antiseptics destined for use in buildings, since it has been found that this fungus shows marked deviations from the results with the two others. The [tabulated] results of an experiment to determine the *doses toxicae* of some water-soluble antiseptics to *C. puteana*, *F. annosus*, *M. lacrymans*, and *Lentinus squamosus* [*L. lepideus*] show marked discrepancies between the data obtained, respectively, on agar and wood.

NAPPER (MAUDE E.). **Observations on spore germination and specialization of parasitism in Cystopus candidus.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 81–100, 2 figs., 1 graph, 1933.

A brief account is given of the author's investigations of some points in the biology of *Cystopus candidus* on various crucifers in Great Britain, in the course of which it was found that, provided all other factors are favourable, the conidia germinate at temperatures ranging from 1° C. to about, but not above, 20°, provided that they have been cooled down to these temperatures from one above 20° to 22°. It was also shown that the conidia do not germinate unless first dried so that their maximum content in water has been reduced by about 30 per cent. (within the limits of 28 and 36 per cent.). There was evidence that in nature this reduction in the water content of the conidia is directly related to the drying of the host tissues, which in its turn is in direct relationship to weather conditions, and that the more rapid the loss of water

the shorter is the period required for germination, and the higher the percentage germination obtained, when sown in water. Within wide limits, the age of the conidia did not appear to be a factor controlling their germination. The latter occurs through the ejection of zoospores in a more or less imperfectly differentiated mass into a rounded vesicle, in which their formation is completed. The length of their period of motility decreases as the temperature increases. Histological studies showed that in susceptible plants infection invariably occurs through the stomata; in resistant plants the germ-tube was seen to enter the stomatal chamber, but its further growth never proceeded beyond the formation of a haustorium.

Further work, including cross-inoculations of 25 species or subspecies belonging to 13 genera of the Cruciferae, collected from widely separated parts of Great Britain, showed the existence of at least 21 different biological forms of *C. candidus*, all of which can infect *Brassica alba* [cf. *R.A.M.*, x, pp. 131, 556]. The fixity of these forms, indicated by the cross-inoculation experiments, was confirmed by field observations, since wherever different cruciferous plants were growing side by side, it was common to find one type of host heavily infected, without a trace of infection in the others. However, some forms, usually the most common and generally distributed (e.g., those on *Capsella bursa-pastoris* and *Arabis alpina*) have an overlapping host range which may extend to some six different genera. The biological form on *Brassica oleracea* and its varieties was commonly found in the extreme south-west of England, and is comparatively rare elsewhere, and that on rape (*B. rapa*) appears to be restricted to certain parts of Somerset. No 'bridging' hosts and no appreciable varietal resistance have been found.

VERONA (O.). **Sul cosidetto 'vaiolo' del Cavolfiore.** [On the so-called pox of Cauliflower.]—*Boll. R. Ist. Sup. Agr. di Pisa*, viii, pp. 291–300, 1 pl., 1932.

A disease of cauliflowers in the neighbourhood of Pisa, characterized by the production of small, roundish, black spots on the corymbs, sometimes with resultant rotting, is caused by various species of *Alternaria*, including *A. brassicae* [*R.A.M.*, ix, p. 230; xiii, p. 3] and *A. tenuis*, as well as by other fungi, such as *Macrosporium commune*, *Aspergillus niger*, and *Cladosporium herbarum*, either alone or in combination with the *Alternaria* spp.

NEILL (J. C.) & BRIEN (R. M.). **Occurrence of dry rot on Rape and Chou Moellier in the field.**—*New Zealand Journ. of Agric.*, xlvii, 1, pp. 19–20, 2 figs., 1933.

Stem cankers on the chou moellier [marrow-stem] variety of kale [*Brassica oleracea acephala*] and on rape [*B. rapus*] in New Zealand yielded the highly virulent strain II B of *Phoma lingam* [*R.A.M.*, vii, p. 70; xii, p. 481], this being the first New Zealand record of the disease on these hosts in the field. One field was ploughed up from grass for the first crop of swedes in 1930–1, followed by rape in 1931–2; in 1932 it was sown with a mixture of chou moellier and swedes. By May, 1933, practically all the

swedes had succumbed to dry rot, and the chou moellier showed numerous cankers. An adjoining field carried rape, which had been twice fed off, leaving only the stems, almost every one of which showed a dry-rot lesion spreading down from the top. Rape and chou moellier are therefore dangerous crops with which to precede swedes or turnips in a short rotation in the same or neighbouring fields.

JENKINS (ANNA E.). **Further studies of Lima-Bean scab.**—*Phytopath.*, xxiii, 8, pp. 662–666, 1 fig., 1933.

Costa Rica, Nicaragua, Guatemala, and El Salvador (Central America), the Dominican Republic, and possibly Jamaica are added to the known range of Lima bean (*Phaseolus lunatus*) scab (*Elsinoe canavaliae*), previously reported from Cuba, Porto Rico, and Mexico [*R.A.M.*, xii, p. 742]. The Guatemala specimen, dated 1890, now constitutes the earliest known material of the disease. Diseased Lima beans, alleged to be of Jamaican origin, were recently intercepted in a passenger's baggage entering the United States.

Failure to isolate *E. canavaliae* from infected dry pods after nearly five months either at room temperature or 17° C. suggests that the fungus was no longer viable. Ascospores removed from pod lesions and kept at 8° remained hyaline or pale for a month, whereas those in fresh lesions kept moist for a few days were reddish-brown. Cultures of *E. canavaliae* made no growth at 0°, a little at 5°, and increasing amounts up to 25°.

BOBKO (E. V.) & BELVOUSSOV (M. A.). **Importance du bore pour la Betterave à sucre.** [Importance of boron for the Sugar Beet.]—*Ann. Agron.*, iii, 4, pp. 493–504, 3 figs., 1933.

After a brief review of the literature dealing with the boron requirements of various plants, the authors describe their own experiments with flask cultures of sugar beet seedlings on Follen's nutrient medium. In the absence of boron, a week after their transfer to the flasks, the plants showed signs of lagging in their development, and the young leaves dried and blackened as soon as they emerged from the buds; at the end of 25 days all the seedlings were dead. On the other hand, in two flasks to which boric acid at the rate of 2 mg. per l. was added a fortnight after the transfer of the seedlings, the latter immediately responded by the production of fresh leaves to replace the dead ones, and the roots formed new ramifications, the further development of the seedlings continuing normally. When, however, some of these plants were transferred later on back to the medium without boric acid, their further growth was delayed, and their dry weight at the end of the experiment was significantly less than that of the seedlings uninterruptedly grown in the presence of boron. These tests are considered to support Brandenburg's findings regarding the curative effect of boron against the heart rot of beet [*R.A.M.*, xii, p. 2], a further confirmation of which was supplied by the authors' pot experiments, in which beet seedlings were grown in soil with a high lime content with and without boric acid. The results showed that the addition of this substance completely neutralized the detri-

mental action of an excess of lime on the beets [ibid., ix, p. 757], and even rendered it beneficial to the yield of the crop.

GOTO (K.). **Onion rusts of Japan I.**—*Journ. Soc. Trop. Agric.*, v, 2, pp. 167–177, 2 figs., 1933.

In order to aid in determining whether both *Puccinia allii* and *P. porri* cause onion rust in Japan [*R.A.M.*, ix, p. 82; xi, p. 619], the writer carried out comparative biometrical and morphological studies on material collected in different localities, supplemented by inoculation experiments with the various strains thus obtained.

The orange-yellow, globose to elliptical or ovoid uredospores of 26 strains comprising the northern rusts on *Allium fistulosum* measured 30 to 88 by 4 to 10 μ (mean 45 to 50 by 5 to 6 μ), the corresponding figures for 26 southern strains on the same host being 10 to 90 by 4 to 9 μ (44 to 50 by 5 μ), for one on *A. scorodoprasum* 18 to 40 by 3 to 8 μ (30 by 6 μ), and for three on *A. bakeri* 10 to 50 by 4 to 8 μ (35 to 40 by 5 to 6 μ). The number of germ-pores ranged from 7 to 14 (mean 8 to 11) in the 26 northern strains, from 7 to 12 (7 to 11) in the 26 southern on *A. fistulosum*, from 7 to 10 for the *A. bakeri* strains, and from 7 to 12 for a German strain on *A. fistulosum*.

The teleutosori of the southern strains on *A. fistulosum* are persistently sub-epidermal, greyish-black to black, round to elliptical or deformed, 0·2 to 2·8 by 0·1 to 1·8 mm. (mean 0·5 to 0·8 by 0·3 to 0·5 mm.); those on northern material are blackish-brown when covered but inclined to rupture, when they are greyish or brownish- to blackish-grey, fusiform, and measure 0·3 to 4 by 0·2 to 2·5 mm. (mean 1·0 to 2·0 by 0·5 to 1·0 mm.) compared with 0·2 to 3 by 0·2 to 1·5 mm. (mean 0·8 to 1·5 by 0·5 to 1·0 mm.) for the covered teleutosori. The paraphyses of the southern strains resembled those of European specimens of *P. allii*, while those of northern strains resembled *P. porri*, the *A. bakeri* specimens being intermediate.

Inoculation experiments on *A. fistulosum* showed that teleutosori formed abundantly in the northern strains during the winter and sparsely towards the spring, when uredosori were produced in large numbers. In the southern strains teleutosori appear to be rarely produced. In general, the northern strains were less pathogenic to *A. cepa* than to *A. fistulosum*, the southern strains being still less virulent. The northern strains produced abundant teleutosori on *A. scorodoprasum*. *A. bakeri* and *A. odorum* resisted infection from *A. fistulosum*, while *A. porrum* developed only a few pustules containing uredospores and one covered teleutosorus on inoculation with a northern strain, another northern and a southern strain giving negative results.

KAISER (P.). **Sellerie-Rost—Sellerie-Schorf!** [Celery rust—Celery scab!]—*Gartenflora*, lxxxii, 8, pp. 229–230, 1933.

So severe is the damage caused in German celery plantings by scab (*Phoma apiicola*) [*R.A.M.*, xi, p. 91] that cultivation is often unprofitable unless drastic control measures are adopted. This disease is frequently confused with rust (*Puccinia apii*) [ibid., v,

p. 532], a comparatively harmless leaf infection. Scab may be combated by cultural practices which are briefly indicated.

WOODROOF (NAOMI C.). **Two leaf spots of the Peanut (Arachis hypogaea L.).**—*Phytopath.*, xxiii, 8, pp. 627–640, 6 figs., 1933.

Attention is drawn to the occurrence of two leaf spots on groundnuts [*R.A.M.*, xii, p. 357], and to the prevailing confusion in the description and nomenclature of the causal organisms. From a comparative study [full details of which are given] of the relevant literature and of herbarium material, the writer concludes that these two diseases occur in nearly all groundnut-growing areas, including Georgia where her field observations were made.

Cercospora arachidicola Hori (*Ann. Rept. Nishigahara Agric. Exper. Stat.*, Tokyo, p. 26, 1917), syn. *C. arachidis* P. Henn. var. *macrospora* Maff. [*R.A.M.*, xi, p. 20], produces irregularly circular or elliptical, often confluent, dark brown to black spots, 1 mm. to 1 cm. in diameter, surrounded by a yellow halo. The mycelium is both internal and external, inter- and intracellular, and without haustoria. The conidiophores of the fungus are amphigenous and may emerge through the stomata or between or through the outer epidermal cell walls. They are subgeniculate, 21·6 to 40·5 by 3·2 to 4·5 μ, yellowish-brown, continuous or uni- to biseptate, with distinct scars marking the point of attachment of the conidia, which are hyaline to pale yellow or slightly olivaceous, obclavate, measure 37·8 to 108 by 2·7 to 5·4 μ, and are 4- to 12-septate, usually 5 to 7. Spermogonia are formed on the fallen leaves late in September or early in October. The mycelium grows very slowly in culture, forming a dense, black mass; conidia have not been observed under artificial growth conditions.

The spots produced by *C. personata* are circular, 1 to 7 mm. in diameter, surrounded by bright yellow halos on the upper surface, and sometimes by pale yellowish-green ones on the lower. The mycelium is entirely internal, branched haustoria being formed in the palisade and spongy mesophyll cells. Tufts of conidiophores develop on the lower leaf surface. The stems and leaf petioles often bear elliptical spots. The continuous or uni- to biseptate conidiophores are reddish-brown, often with hyaline apices, subgeniculate or shouldered, with conspicuous scars of conidial attachment. They develop from loosely stromatic subepidermal mycelial masses, frequently in the substomatal cavities, and rupture the epidermis on emergence. The light brown to olivaceous, obclavate to clavate or cylindrical conidia measure 18 to 60 by 5·4 to 10·8 μ and are 1- to 7-septate. Spermogonia develop during the autumn.

C. arachidicola seems to occur fairly consistently year after year, whereas the development of *C. personata* is erratic, possibly depending on the weather; the latter is, however, the more destructive of the two leaf spots.

BRIANT (A. K.). **Maladies affecting Arrowroot in St. Vincent.**—*Trop. Agriculture*, x, 7, pp. 183–188, 4 figs., 1 diag., 1933.

After referring to the fact that 'burning' disease (*Rosellinia ? bunodes*) of arrowroot [*Maranta arundinacea*], first recorded in St. Vincent in 1891, occurs every year in very slowly spreading,

definite patches, the author briefly describes a survey made of the incidence of the disease on a large number of estates in the island. This demonstrated that the affected patches were often in hollows where the subsoil was wet and sandy, while unaffected places in the immediate vicinity had a dry subsoil. These wet subsoils occur even on slopes, the drainage water of which tends to collect in depressions running down the slope, which are thus kept constantly moist.

The author considers that the presence of *Rosellinia* in a field does not necessarily result in parasitism, even if a suitable host is present. In his opinion, the fungus is a common saprophytic inhabitant of soils, especially those rich in organic material, the pathogenic capacity of which depends entirely on the presence of certain conditions, of which excessive moisture is the chief.

Prevention consists in adopting improved draining methods [which are indicated] and in planting disease-free material.

The type of disturbance in the arrowroot rhizome known as 'cigar' or 'long' root is distributed fairly generally throughout St. Vincent. A field planted with arrowroot for the first time for several years seldom produces cigar roots during the first and second years, but their number apparently increases with each successive ratoon. These roots contain little starch but much fibre, and the internodes are generally long. No evidence was obtained of parasitic origin, and the condition appears to be due to particular soil factors, such as mineral deficiency. Parts of fields where animals had been penned were observed to have produced no cigar roots, though they were abundantly present in the other parts of the same field.

GENTY (P.). **Note complémentaire aux truffes de Bourgogne.** [A supplementary note on the truffles of Burgundy.]—*Bull. Soc. Bot. de France,* lxxx, 1–2, pp. 69–72, 1933.

Further notes are given on the truffles of Burgundy [*R.A.M.*, xii, p. 198], in which seven more species of *Tuber* and related genera are described in popular terms. Of these, only *T. moschatum* and *Chaeromyces meandriformis* ('truffe blanche') are of culinary interest.

LIBUTTI (D.). **L'antracnosi o vaiuolo della Vite.** [Anthracnose or small pox of the Vine.]—*L'Istria Agric.*, N.S., xiii, 13, pp. 284–289, 1 fig., 1933.

This is a brief popular account of vine anthracnose [*Gloeosporium ampelophagum*] in Istria, together with some recommendations for its control. Special stress is laid on the necessity of preventive measures, among which swabbing the vine stocks once or twice during winter with a solution of 30 kg. iron sulphate and 3 kg. sulphuric acid in 100 l. water, and the careful removal of all infected vine débris from the vineyards, are considered the most effective.

CLOUSTON (D.). **Agricultural Botany, 1932–1933.**—*Rept. North of Scotland Coll. of Agric. for the year 1932–33* (Aberdeen Journals Ltd.), pp. 8–10, 1933.

The following are among the plant diseases mentioned in this

report. Turnips suffered exceptionally severe damage from mildew [*Erysiphe polygoni*: *R.A.M.*, vii, p. 132]. Prompt action on the part of local growers appears to have arrested the spread of 'red core' of strawberries [*P.* (?) *cinnamomi*: ibid., xii, p. 7], no further cases of which were reported in the district during the period under review. One case of 'brown patch' of lawns due to *Rhizoctonia* and *Fusarium* spp. [ibid., xii, p. 450] was investigated.

Successful control of tomato leaf mould [*Cladosporium fulvum*] was given by the application of $\frac{1}{8}$ oz. shirlan paste and $\frac{1}{4}$ oz. agral I in 1 gall. water [ibid., xiii, p. 10].

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1932. [Summary reports on the work done in laboratories during 1932.]—*Ann. des Épiphyties*, xix, 1–2, pp. 1–46, 1933.

These reports from the various phytopathological, entomological, and agricultural research stations in France [cf. *R.A.M.*, xii, p. 75] contain among many others the following items of interest, apart from those already noticed from other sources.

Collar rot of peas associated with *Thielaviopsis basicola* and *Aphanomyces euteiches* [ibid., xii, p. 489] remains prevalent in the Seine-et-Oise, where out of forty-five varieties tested by Labrousse and Marcel some showed both a certain resistance and commercial qualities. Inoculations with *Bacterium* [*Pseudomonas*] *pisi* isolated by Labrousse from Welcome peas [loc. cit.] gave positive results on the Alderman, William the First, Horsford, and Orgueil du Marché varieties. *Bact. medicaginis* var. *phaseolicola* inoculated into 234 varieties of beans [*Phaseolus vulgaris*] gave positive results on only a few [ibid., xi, p. 344].

Not previously reported in France, pear anthracnose (*Elsinoe piri*) [ibid., xi, p. 723] was studied by Arnaud, especially as regards the differences between the lesions caused by it and those produced by *Septoria pyricola* and *Coryneum foliicolum*.

In the vicinity of Bordeaux the meteorological conditions predisposing to widespread attacks of potato blight (*Phytophthora infestans*) [ibid., xii, p. 490] consist, according to Dufrénoy's observations, in the persistence of dew on the leaves for four hours continuously with a temperature over 10° C., and an overcast sky for four-fifths of the following day with a precipitation of at least 0·1 mm. of rain.

Peach leaf curl (*Taphrina deformans*) was controlled by Dufrénoy with 2 per cent. neutral Bordeaux mixture and 6 per cent. anthracene oil [ibid., xi, p. 247; xii, p. 301] emulsified with alkylised sulphonaphthalene applied between November and January.

Small new centres of potato wart disease (*Synchytrium endobioticum*) [ibid., xii, pp. 75, 490] were noted at three localities near Brumath (Bas-Rhin), two at Saint-Amarin (Haut-Rhin), one in the Vosges, and one at Vieux-Condé (Nord).

Tests of the control of apple scab (*Venturia inaequalis*) [ibid., xii, p. 8] in the Clermont-Ferrand region, where it was very severe, showed that a winter spray of Bordeaux mixture and anthracene oil should be applied in March, shortly before the buds burst, that the spray applied between full and late flowering plays

the chief part in protecting the fruit and foliage, that this application must be supplemented by another five weeks later, and, finally, that the application made at the beginning of flowering has very little effect, especially against fruit infection.

A short section deals with the researches of S. Métalnikov of the Pasteur Institute on microbes pathogenic to insects [ibid., viii, p. 309; xiii, p. 30], the preservation of the virulence of the organisms over long periods, and the rapid experimental immunization of the insects. There are also brief special reports on vine and potato diseases.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1932.** [Annual report for 1932 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Ann. Agric. de la Suisse*, xxxiv, 8, pp. 919–972, 9 figs., 4 graphs, 1933.

This report contains some brief notes of general phytopathological interest on the occurrence and control of vine and other fruit diseases in the vicinity of Lausanne in 1932 [cf. *R.A.M.*, xii, p. 8].

UPPAL (B. N.). **India: plant diseases in the Bombay Presidency.**—*Internat. Bull. of Plant. Protect.*, vii, 8, p. 187, 1933.

Panama disease of bananas [*Fusarium oxysporum cubense*: *R.A.M.*, xii, p. 381] has broken out in a severe form near Poona, the only variety so far affected, however, being that locally known as Son. Infection has been spread to a slight extent by means of suckers from diseased plants, but steps are being taken to prevent further dissemination.

The agent of citrus gummosis in the Bombay Presidency has been determined by S. F. Ashby as *Phytophthora palmivora* [ibid., ix, p. 506].

Leeina philippinensis [ibid., iii, p. 305] (also identified by S. F. Ashby) was isolated from sugar-cane stems grown near Poona.

NARASIMHAN (M. J.). **Annual Report of the Mycological Section, for the year 1931–32.**—*Admin. Rept. Agric. Dept. Mysore for the year 1931-32*, pp. 32–35, 1933.

During the year ending 30th June, 1932, materials sufficient to spray about 9,400 acres against areca palm [*Areca catechu*] koleroga [*Phytophthora arecae*: *R.A.M.*, xii, p. 76] were sold to the growers at a cost of Rs. 25,449 [approximately £1,908 13*s.* 6*d.*]. *Daedalea*-like sporophores developed in two cultures on moist cotton of pieces of areca stem affected by the 'trunk-splitting' disease [ibid., x, p. 787], the incubation period being about ten months.

The *Helminthosporium* [? *H. nodulosum*: ibid., xi, p. 426] disease of ragi [*Eleusine coracana*] is characterized by brownish spots on the leaves and leaf sheaths and in severe cases by brown lesions on the culm. The fungus sporulates well on most standard media and forms abundant sclerotia on several. The viability of the spores was maintained after a year's storage on the affected grains, for over a week on the husks at a temperature below 10° C., and for the same period of desiccation. Positive results were given

by inoculation tests with aqueous suspensions of the fungus on healthy leaves and stems of *E. coracana* seedlings, which succumbed in about a fortnight and were found to bear numerous spores.

Spraying against *Alternaria* of potato [*A. solani*] with 0·5 per cent. Bordeaux mixture was carried out in about ten villages in the Bangalore and Kolar districts, the first application being given when the crop was 15 to 20 days old and the second a month later.

SU (M. T.). **Report of the Mycologist, Burma, Mandalay for the year ended the 31st March 1933.**—12 pp., 1933.

The foot rot of betel vine [*Piper betle*] caused by *Phytophthora colocasiae* [*R.A.M.*, xii, p. 355] was found to be controllable by monthly applications to the soil of 1 per cent. Bordeaux mixture, or in milder cases by 0·5 per cent. monthly or 1 per cent. every three months.

Of the various organisms associated with the decay of mangosteens [*Garcinia mangostana*], namely *Diplodia natalensis, Penicillium, Pestalozzia,* and *Pythium* spp., the first-named was responsible for the most extensive infection (12·5 to 100 per cent.) [ibid., xi, p. 62]. The fungus enters the fruit through the rind as well as through the stalk, the main source of infection probably being the dead twigs and young fallen fruits in the plantations.

Tilletia horrida was unusually prevalent on rice [ibid., xi, p. 324] in Mandalay, causing a loss of 2 to 5 per cent. of the grains, especially in the Taungdeikpan variety.

It is stated, in connexion with the green flowering disease of *Sesamum indicum* [ibid., xii, p. 748], that a similar condition in *Justicia gendarussa* has been found to be transmissible by grafting and is therefore probably due to a virus.

PARK (M.). **Report on the work of the Mycological Division.**—*Ceylon Administration Reports, Report of the Director of Agric. for 1932*, pp. D 116–D 122, 1933.

Leaf and pod infection of *Hevea* rubber by *Phytophthora palmivora* [*R.A.M.*, xii, p. 77] was slight, owing to the late monsoon of 1932, but the fungus did considerable damage by killing young shoots in bud-wood nurseries and young clearings; nurseries should be sprayed every week during wet weather with a standard fungicide, this treatment having given effective control.

Bunchy top of plantains [loc. cit.] was widespread, and Panama disease (*Fusarium* [*oxysporum*] *cubense*) caused considerable losses in one locality in Colombo District. Successful inoculations were effected with pure cultures of the latter from diseased plants. Field observations and controlled experiments showed that the varieties Mondan, Sona-mondan, Kolikuttu, and Kathemondan (S. Kitala) are relatively susceptible to Panama disease, while Embul hondarawala and Sowandel are relatively resistant.

The tung oil tree (*Aleurites montana*) was attacked by *Fomes lignosus, Poria* (? *hypolateritia*), and *Ustulina zonata,* as well as by *Sclerotium rolfsii,* which was found on the lower leaves of young plants; *F. lignosus* also attacked *Croton tiglium,* a leaf and fruit spot of the same host being caused by *Cercospora tiglii.*

Citrus canker (*Pseudomonas citri*) [ibid., xii, p. 433] was ascer-

tained to be extremely dependent on seasonal conditions and to be widespread at all elevations below 3,000 ft.

Inoculations with pure cultures of *Ceratostomella paradoxa* showed that this fungus can cause a disease of coco-nut indistinguishable from the leaf break formerly attributed to a *Botryodiplodia* [ibid., vi, p. 289], as well as an inflorescence disease of areca palms [*Areca catechu*].

The most important tobacco disease was bacterial wilt (*Bacterium solanacearum*), which occurs in all the tobacco-growing areas of Ceylon.

Among the new records for Ceylon were leaf and stem disease of *Passiflora edulis* due to a *Macrosporium* [cf. ibid., x, p. 394], bacterial wilt of parsley (? *Bact. nelliae*), and *Nematospora coryli* in *Phaseolus lunatus* beans.

SMITH (F. E. V.). **Plant diseases in Jamaica in 1932. Report of the Government Microbiologist.**—*Ann. Rept. Dept. of Sci. and Agric. Jamaica for the year ended 31st December, 1932*, pp. 13–16, 1933.

Except in the parish of St. Andrew, the increase in the incidence of Panama disease of bananas (*Fusarium cubense*) [*F. oxysporum cubense*: *R.A.M.*, xii, p. 38] was noticeably less in 1932 than in the three foregoing years, amounting only to 26 per cent. compared with 31 per cent. in 1931 and over 100 in 1930 and 1929. The inundation of the plantations by the swollen rivers during the rains is held to be mostly responsible for the majority of fresh infections. The additional losses of banana land from Panama disease in 1932, over the total of 15,660 acres abandoned up to the end of 1931, were estimated at 1,700 acres, and it is expected that by 1940 the effects of the disorder on the export trade will become very noticeable.

Coco-nuts suffered from an outbreak of bud rot [*Phytophthora palmivora*: ibid., viii, pp. 526, 674] in the western end of the Island as a result of the hurricane. The two forms of leaf discoloration—brown and ashen-grey—previously reported [ibid., xii, p. 90] became very apparent in St. Mary and the vicinity, evidently as a sequel to the accumulated physiological disturbances associated with four or five years of abnormal weather. Though obviously related to the 'bronze wilt' of Trinidad, the Jamaican trouble is clearly distinct, no deaths having been reported and rapid recovery occurring with a return to more favourable conditions.

Good control of damping-off (*Rhizoctonia* [*Corticium*] *solani*) among coffee seedlings was obtained by the use of Cheshunt mixture [ibid., i, p. 373], which has also proved effective on a number of other crops.

A Phycomycete believed to be identical with *P. parasitica* was isolated from pineapples infected by a malodorous basal rot [ibid., xi, p. 625].

Leaf mould (*Cladosporium fulvum*) and late blight (*P. infestans*) were unusually prevalent on tomatoes; in the former case preliminary spraying experiments with shirlan and agral [see above, p. 76] gave promising results. Both leaf mould and mosaic were more severe on American than on European tomato varieties.

DASH (J. S.). **Botanical and mycological investigations.**—*Admin. Rept. Dept. Agric. British Guiana for the year 1932*, pp. 30–31, 1933.

The following items of phytopathological interest occur in this report. The sudden wilting of Liberian coffee bushes has been ascertained by Dr. Stahel to be due to phloem necrosis caused by the flagellate *Phytomonas* [*leptovasorum*] which is responsible for serious losses in Surinam [*R.A.M.*, xiii, p. 28]. Generally speaking, the disease is confined to isolated bushes, but in September it was reported to be prevalent over an entire grant in the North West District.

Black eye disease [or fruitlet rot] of pineapples [variously attributed in the West Indies to a *Penicillium* or a bacterium, and elsewhere to *Bacillus ananas* or species of *Penicillium* or *Aspergillus* in association with mites: ibid., vii, pp. 225, 794; x, p. 473] appeared at the New Pineapple Company's cultivation on the Demerara River. No means of control has proved effective in other countries where the disorder is well known.

DUPONT (P. R.). **Work connected with insect pests and fungus diseases.**—*Ann. Rept. Dept. of Agric. Seychelles for the year 1932*, pp. 4–5, 1933.

Citrus plants were found to be infected by canker (*Bacterium* [*Pseudomonas*] *citri*. *Rhizoctonia* [*Corticium*] *solani* attacked two of the best cover plants grown in the Seychelles, viz., *Centrosema pubescens* and *Vigna hosei* [*V. oligosperma*: *R.A.M.*, xi, p. 601], but was not observed on *Indigofera endecaphylla* which, for this reason, merits the first place among the introduced cover plants.

Annual Report, Department of Agriculture, Northern Rhodesia, for the year 1932.—27 pp., 1933.

In the section of this report dealing with the work of the Mazabuka Experiment Station, Northern Rhodesia (pp. 9–11), it is stated that three years' seasonal distribution studies showed that the stainers *Dysdercus superstitiosus*, *D. fasciatus*, *D. intermedius*, and, to a less extent, the Pentatomid *Callidea dregei* are concerned in the transmission of cotton internal boll rot [associated with *Nematospora gossypii* and *N. coryli*: *R.A.M.*, xii, p. 438]. *D. superstitiosus* appears in the field when flowering begins and damages the early crop, while *D. fasciatus* appears later and causes the extensive staining of the later crop. *D. intermedius* and *C. dregei* are relatively unimportant. In 1931 62·4 and in 1932 35·4 per cent. of the mature crop was stained.

The only important wild hosts in the cotton-growing area capable of carrying a stainer population are *Thespesia rogersii* and *Adansonia digitata*, of which the former predominates. The normal annual hosts appear to be *Hibiscus* spp., of which by far the most abundant is *H. cannabinus*. In 1932 pure stands of this species occurred over large areas in Northern Rhodesia and from January to June *D. superstitiosus* was present on it in large numbers.

BORG (P.). **Appendix F. Report of the Plant Pathologist.**—*Ann. Rept. on the Working of the Malta Dept. of Agric. during 1932–33*, pp. xiv–xviii, 1933.

Many old citrus trees at Boschetto are suffering severely from a canker which generally begins at an incompletely healed wound and spreads to the heartwood, producing unsightly cavities. Satisfactory results have been obtained on some 90 trees by scooping out the dead tissues and disinfecting the wounds twice, at an interval of a week, after which the cavity is filled with a mixture of cement and fine sand. About 70 orange trees affected by root rot due to *Armillaria mellea* were successfully treated by the excision of the diseased parts and painting the rest of the roots with an iron sulphate solution [*R.A.M.*, vi, p. 102; ix, p. 302], a thin layer of the salt being also spread over the bottom of the excavation surrounding the trees.

An extremely virulent outbreak of potato blight (*Phytophthora infestans*) occurred during a very wet period between 20th and 27th November [ibid., xi, p. 769].

MATTRAS (H.). **Observations sur les rouilles du Blé faites à Versailles en 1931 et 1932.** [Observations on Wheat rusts made at Versailles in 1931 and 1932.]—*Ann. des Épiphyties*, xviii, 6, pp. 384–397, 1932. [Received November, 1933.]

Further investigations conducted at Versailles from 1930 to 1932 into the effect of meteorological factors, data of sowing, and stage of growth upon the susceptibility of wheat to rusts, estimated chiefly by the method of Ducomet and Foëx [*R.A.M.*, viii, p. 161], showed that *Puccinia glumarum* appeared towards the end of March and early in April, *P. triticina* in June, and *P. graminis* at the end of June and early in July, the periods of heaviest infection for the three rusts being, respectively, in May and June, June and July, and from July or August until harvest time. In general they flourish at temperatures between 10° and 15°, 15° and 22°, and 18° and 25° C., respectively. At 28° to 30° *P. glumarum* ceases to spread, but the other two continue.

It was ascertained that the degree of susceptibility of a given wheat variety to a given rust is not constant for all stages of growth.

Owing to the lateness of its attack on the leaves, *P. triticina* is, on the whole, unimportant agriculturally in France, where *P. glumarum* and *P. graminis*, on the other hand, sometimes cause disastrous losses.

Two years' [tabulated] observations indicated that Hope was the most resistant variety tested, as regards *P. glumarum* and *P. graminis*, followed in descending order by Préparateur Etienne, Warren, Piane 692, Ile de France, K5, P.L.M.*I*, and Providence.

STEINER (H.). **Ueber das Auftreten und die Verbreitung der Getreiderostarten in Oesterreich.** [On the occurrence and distribution of the cereal rust species in Austria.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 488–496, 1933.

The data obtained from a systematic cereal rust survey throughout Austria (1930–2) initiated by the Vienna Institute of Agronomy,

supplemented by the writer's personal observations, indicate that wheat is attacked primarily by *Puccinia triticina* [see preceding and next abstracts], followed by *P. graminis*, while *P. glumarum* is of minor importance, except in the mountains. The principal rust on rye is *P. dispersa* [*P. secalina*], *P. graminis* causing little damage. Barley is mostly infected by *P. simplex* [*P. anomala*], and oats are attacked by *P. coronifera* [*P. lolii*] and *P. graminis*.

STEINER (H.). **Ein Beitrag zur Frage der Ueberwinterung von Puccinia triticina Erikss. und Puccinia dispersa Erikss. und Beobachtungen über die Entwicklung dieser Roste auf ihren Wirtspflanzen.** [A contribution to the problem of the overwintering of *Puccinia triticina* Erikss. and *Puccinia dispersa* Erikss. and observations on the development of these rusts on their host plants.]—*Landw. Jahrb.*, lxxviii, 2, pp. 259–278, 1 diag., 3 graphs, 1933.

Studies on the overwintering of the brown rusts of wheat and rye (*Puccinia triticina* and *P. dispersa* [*P. secalina*]) in Austria were carried out at the Institute of Agronomy, Vienna, from 1930 to 1933 [cf. preceding and next abstracts].

Germination tests made in December, January, and March showed that the uredospores of both the rusts were still partially viable at these times (to an average extent of 20 per cent.) [cf. *R.A.M.*, xii, p. 16]. The number of uredo pustules that develop in the early spring is considerably less than in the autumn, largely owing to the desiccation of the lower leaves which are primarily infected. Planting experiments in 1931–2 with several wheat and rye varieties indicated the possibility of mycelial overwintering in both rusts. In the autumn the infection on rye was considerably heavier than on wheat, pustule formation being also more profuse on the former.

Evidence was forthcoming for the occurrence of so-called 'phases of latency' in the rusts coinciding with certain stages of development in the host. Thus, during the period between the germination of the autumn-sown seed and stem development, uredo pustules are practically absent. Pustule formation begins with stem development and continues throughout the growing period. A second phase of latency occurs in the development of the rusts in the early spring, beginning shortly before tillering and ending soon after on the lower leaves, while on the upper ones it is prolonged until after flowering. After the harvests the rusts can survive in the uredo stage on plant refuse left in the field, as well as on volunteer plants, until the germination of the autumn seed [cf. ibid., v, p. 724].

STEINER (H.). **Ein Beitrag zur Frage des Einflusses verschiedener Bodenfeuchtigkeit auf den Befall (Infektionstypus) des Weizens mit Puccinia triticina Erikss.** [A contribution to the question of the influence of differing soil moisture on the attack (type of infection) of Wheat by *Puccinia triticina* Erikss.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 484–487, 1933.

Apart from some minor modifications, no alteration could be

induced in the type of infection resulting from uredospore inoculations of *Puccinia triticina* [see preceding and next abstracts] at the Vienna Institute of Agronomy on a number of wheat varieties by varying the soil moisture between 20, 40, 60, and 80 per cent. of the water-holding capacity of the soil. This does not agree with A. Volk's results with *P. dispersa* [*P. secalina*] on rye [*R.A.M.*, x, p. 479].

SCHILCHER (R.). **Beitrag zur Rostfrage.** [A contribution to the rust problem.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8-9, pp. 533–563, 4 graphs, 1933.

Following a brief survey of the principal contemporary literature on the cereal rusts (*Puccinia* spp.) with special reference to the problem of physiologic strains and biotypes, the writer fully describes his experiments (1929–32) at the Vienna Plant Protection Institute on the control of brown rust of wheat (*P. triticina*) [see preceding abstracts].

In order to examine the possibilities of combating the disease by chemical methods, the plants were sprayed once to three times between the beginning of May and early June, 1929, with 1 per cent. Bordeaux mixture, other plots being dusted with unoiled calcium cyanamide in amounts up to 1 kg. per 100 sq. m. While the former treatment proved quite ineffectual, some benefit was derived from the latter, though accompanied by burning of the leaves [*R.A.M.*, x, p. 88]. No apparent influence on the course of infection was exerted in 1929 by the depth or density of sowing or the time of planting. Potash and phosphorus fertilizers were found to reduce the incidence of rust, which was promoted, on the other hand, by nitrogenous ones [ibid., xi, p. 98]. In the three following years the experiments were extended to include 25 wheat varieties and two other localities, the influence of weather conditions being carefully observed. The time, severity, and nature of the rust attacks were found to be dependent especially on the weather conditions prevailing during April to June and in the preceding autumn. In the course of the trials it was observed that *P. triticina*, in contrast to *P. glumarum*, is not adversely affected by a sudden rise in temperature [cf. ibid., xii, p. 557]. The only physiologic forms of *P. triticina* hitherto isolated in Austria are XIII, XIV, XV, and XXI [ibid., xii, p. 619].

HEMMI (T.) & ABE (T.). **On the relation of air humidity to germination of urediniospores of some species of Puccinia parasitic on cereals.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 1–9, 1933.

A tabulated account is given of the writers' studies on the influence of relative atmospheric humidity on the germinability of the uredospores of *Puccinia glumarum* and *P. triticina* from wheat and of *P. lolii* from oats [*R.A.M.*, x, p. 587] at Kyoto, Japan.

The uredospores of *P. triticina* germinated profusely in a saturated atmosphere or in a drop of precipitated moisture, whereas only 4·27 per cent. of the dry uredospores exposed to 99 per cent. humidity germinated, and it is doubtful whether any germination

occurred at 95 per cent. The percentage of germinating uredospores of *P. glumarum* in a saturated atmosphere was low (12 per cent.) compared with the figure (44·5 per cent.) obtained in drops of water. At 99 per cent. humidity the germinability of the uredospores of this species averaged 1·5 per cent. The germination percentages for the uredospores of *P. lolii* in water drops, a saturated atmosphere, and at 99 per cent. humidity were 50·1, 34·9, and 16·8, respectively. Neither *P. glumarum* nor *P. lolii* was able to germinate at or below 95 per cent. relative humidity. Microscopical examination after 24 hours of all the spores germinating at 100 or 99 per cent. humidity revealed the presence of a thin surrounding film of water, which was not formed at 95 or 90 per cent. This observation is considered to substantiate the opinion of Beauverie [ibid., iv, p. 154], Melhus and Durrell (*Iowa Agric. Exper. Stat. Res. Bull.* 49, 1919), and others that direct contact with water is essential to uredospore germination in the cereal rusts.

LINDFORS (T.). **Kampen mot Berberisbusken och nödvändigheten av skärpt lagstiftning.** [The campaign against the Barberry bush and the necessity of drastic legislation.]—*Kungl. Landtbruks-Akad. Handl. och Tidskr., 1933*, 4, pp. 441–450, 1933.

The writer traces the history of the barberry eradication campaign against black rust of cereals [*Puccinia graminis*] in Sweden and urges the necessity of more drastic legislation, in particular as regards the elimination of the 200 m. radius clause [see next abstract].

On pp. 450–452 A. von Bergen describes the organization of the campaign in the Södermanland province, the costs of which in 1931–2 are analysed as follows: sodium chlorate Kr. 30,527, salt 18,365 : 50, labour 158,081 : 47, apparatus 7,000, and miscellaneous 27,269 : 71, making a total of Kr. 241,243 : 68 (not including the purely investigational expenses).

LINDFORS (T.). **Utrotning av Berberisbusken.** [The eradication of the Barberry bush.]—*Statens Växtskyddsanst. Flygbl.* 5, 5 pp., 1 col. pl., 1933.

A popular account is given of the part played by the barberry in the dissemination of black rust of cereals [*Puccinia graminis*] in Sweden, together with full directions for its eradication by spreading common salt round the bushes or spraying them with 7 to 8 per cent. sodium chlorate [*R.A.M.*, ix, p. 705 ; x, p. 589]. A note is added on a new amendment (26th May, 1933) to the barberry eradication law of 1918 [ibid., vi, p. 21], by which the regulations now in force in a number of districts are made to apply to other *Berberis* varieties as well as *B. vulgaris* irrespective of their distance from cultivated land, which was formerly fixed at 200 m. [see preceding abstract].

CLARK (J. A.) & HUMPHREY (H. B.). **Inheritance of stem-rust reaction in Wheat.**—*Journ. Amer. Soc. Agron.*, xxv, 8, pp. 497–511, 3 graphs, 1933.

A tabulated account is given of the writers' studies on the

inheritance of stem [black] rust (*Puccinia graminis*) reactions in wheat hybrids. Three groups of reactions are recognized, viz., near immunity, resistance, and susceptibility. Earlier data on crosses of Hope × Marquis and Hope × Reliance were interpreted to show that the rust reaction in these wheats is controlled by two genetic factor pairs, and similar results were later obtained from an H–44 × Ceres cross. The outcome of the investigations is considered to denote that Hope has a single dominant inhibiting factor for near immunity [*R.A.M.*, vii, p. 433], Marquis and Reliance have a dominant factor for susceptibility, H–44 carries both these dominant factors, and the resistant Ceres carries the double recessives.

VOSS (J.). **Gelbrostwiderstandsfähigkeit als Sorteneigenschaft beim Weizen.** [Resistance to yellow rust as a varietal character of wheat.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 9, pp. 73–74, 1933.

This is an explanatory note on W. Straib's recent studies in connexion with the varietal reaction to certain physiologic forms of wheat yellow rust (*Puccinia glumarum*) in Germany [*R.A.M.*, xii, p. 557], with particular reference to the commercial varieties of wheat included in the groups recognized by Straib. The writer's researches on the synonymy and relationships of the various commercially named wheats are considered to have been confirmed by these studies of their reaction to the rust.

SMITH (W. K.). **Inheritance of reaction of Wheat to physiologic forms of Tilletia levis and T. tritici.**—*Journ. Agric. Res.*, xlvii, 2, pp. 89–105, 2 graphs, 1933.

In the experiments described in this paper the author studied the inheritance of resistance to physiologic forms T1, T2, and T3 of *Tilletia tritici* [*T. caries*] and L4 and L5 of *T. levis* [*T. foetens*: *R.A.M.*, xii, p. 618] in crosses between the Hope and Jenkin spring wheats, the first of which is highly resistant to all five forms when sown in the spring but susceptible in autumn sowings, while the second is always susceptible [cf. ibid., xi, p. 705]. The results [which are statistically discussed] of inoculations of the F_3 generation of the crosses indicated that in Hope the factors for resistance to any one of the five bunt forms seem to be the same as those for resistance to any of the others, a satisfactory explanation being offered by the assumption of the existence in this variety of three main factors for resistance, with no indication of the dominance of either resistance or susceptibility.

Hope was also crossed with the winter wheats White Odessa and Ridit, and the F_3 generations were tested for resistance to physiologic form L4 of *T. foetens*, to which White Odessa is moderately and Ridit highly resistant. In the portion of the F_3 generation which was sown in the spring scarcely a trace of bunt showed, indicating that both winter wheats carry at least some of the same factors as Hope for resistance to L4 in spring sowing. In the portion that was sown in the autumn, however, the results did not allow of determining the number of factors for reaction to L4 in the Hope × White Odessa cross, but there was some evidence that

the reaction of Hope to this form, in autumn sowing, differs from that of Ridit by one single main factor. No evidence was obtained in the three crosses discussed of a linkage between the factor or factors for reaction to bunt and the factors for length of awn, colour of glume, and winter or spring habit of growth.

FLOR (H. H.). **Studies on physiologic specialization in Tilletia tritici and T. levis in the Pacific North-west.**—*Journ. Agric. Res.*, xlvii, 4, pp. 193–213, 5 figs., 1 map, 1933.

The results of a survey in 1929 and 1930, during which bunt was collected from 182 fields in the principal wheat-growing areas in Oregon, Washington, and northern Idaho, showed that *Tilletia tritici* [*T. caries*] was present in every collection, while *T. levis* [*T. foetens*] was found in only 60 per cent. of the total number of cases investigated. Numerically *T. foetens* predominated over *T. caries* to the west of the Cascade Mountains, while to the east this was reversed. Pathogenicity tests indicated that the collections contained at least seven physiologic forms of *T. caries* and six of *T. foetens* [see preceding abstract]. Some collections exhibited transitional pathogenicity characters, indicating that they either consisted of a mixture of different forms or were a result of hybridization between two forms [*R.A.M.*, xi, p. 440]. The great majority of the collections (84 per cent.) only comprised the less virulent physiologic forms of *T. caries* and *T. foetens*, but while most of the new virulent forms were obtained chiefly from fields of the resistant Albit and Ridit wheat varieties, they were also found in a few collections from susceptible varieties in widely scattered localities.

Special tests showed that while pathogenically distinct forms of bunt were easily separated by the 'screening' [purifying] effect of resistant wheat varieties, breeding of a given form on such a host (Hussar) for several years did not increase its pathogenicity to that or other varieties.

Cultural studies of the various bunt collections indicated that morphological variations, e.g., in size, colour, character of reticulation of the spore wall, &c., are heritable, but gave no indication of a definite correlation between these characters and pathogenicity. It was also shown that in some instances the morphological characters of two monosporidial cultures, one of *T. caries* and one of *T. foetens*, resembled one another more closely than did two monosporidial cultures of one and the same physiologic form of either species. Temperature during the period of infection did not appear to be a significant factor in the percentage of bunt caused by five distinct physiologic forms tested. No correlation was observed between the cultural characteristics and pathogenicity of the forms, except that non-chromogenic cultures of *T. foetens* invariably belonged to the less pathogenic forms.

VASSILIEVSKY (A.). Техника проращивания спор **Tilletia tritici Wint.** [A method for the germination of the spores of *Tilletia tritici* Wint.]—*Советская Ботаника* [*Botany of the Soviets*], *1933*, Leningrad, 2, p. 97, 1933. [German summary.]

The author states that the method which proved the most satisfactory in germination tests of *Tilletia tritici* [*T. caries*] spores

was to place a drop of a water suspension of the spores on the bottom of a sterilized Petri dish or on a glass slide inside the dish, flatten out the drop as much as possible by shaking the dish or the slide, cover the drop with a small loose cotton-wool wad (about 1 sq. cm.), loosely cover the Petri dish so as to ensure sufficient circulation of air, and incubate the whole preparation at 16° to 18° C. The count of the germinated spores is made on the fifth or sixth day, the spores being clearly visible through the cotton fibres, or the wad may be carefully removed, first moistening it with a drop or two of sterilized water. The method is stated to have given germinations averaging over 70 per cent. of the spores, some of which were seen bearing well-developed clusters of basidiospores.

ECKHOFF (G.). **Beizversuch zu Winterweizen.** [Disinfection test with winter Wheat.]—*Ratschläge für Haus, Garten, Feld,* viii, 9, pp. 139–141, 1933.

Absolute control of wheat bunt [*Tilletia caries* and *T. foetens*] was given in a recent German experiment by dusting with ceresan, 30 minutes' immersion of the seed-grain in a 0·125 per cent. solution of the same preparation, the short disinfection process with 2 per cent. ceresan, and sprinkling with a 0·5 per cent. solution. In the untreated control plots there was 46·5 per cent. complete infection of the ears, corresponding to an average loss of 7·5 cwt. of wheat per ¼ hect. The average cost of the treatment was about Pf. 50 per acre [cf. *R.A.M.*, xii, p. 152].

LINDFORS (T.). **Korta anvisningar rörande utsädesbetning.** [Brief directions for seed-grain disinfection].—*Statens Växtskyddsanst. Flygbl.* 2, 6 pp., 4 figs., 1933.

Directions are given in popular terms for the disinfection of cereal seed-grain against some common fungous diseases in Sweden [*R.A.M.*, xi, p. 568].

SAMUEL (G.) & GARRETT (S. D.). **Ascospore discharge in Ophiobolus graminis, and its probable relation to the development of whiteheads in Wheat.**—*Phytopath.*, xxiii, 9, pp. 721–728, 1933.

The writers have recently observed that during rainy periods in South Australia the ascospores of *Ophiobolus graminis* may be ejected from the perithecia into the air at the rate of several hundred per minute from a single diseased wheat culm. Fields severely infected with whiteheads were found to contain a number of small patches in which the seedlings had been killed by take-all and bore perithecia. The disease is most prevalent on newly cleared *Eucalyptus* scrub land, which is at first continuously cropped with wheat. It usually shows up on the second or third crop and continues until the farms are brought into full cultivation and suitable practices of crop rotation and the like have been adopted. The older wheat-growing regions with established rotations are comparatively free from take-all.

Three main factors appear to be concerned in the epidemiology of take-all, namely, lack of consolidation of the soil, the presence of some inoculum in the soil, and the persistence of showery

weather almost until heading. The heaviest losses from take-all are due to the development of whiteheads just before the crop ripens, at which stage 80 per cent. of the grain of a fine crop may be suddenly destroyed. In 1932, when weather conditions favoured the growth of the fungus, several million bushels of wheat were lost as a result of the disease in South Australia.

Discussing in some detail the above-mentioned three factors predisposing to infection by *O. graminis*, the writers point out that most of the diseased crops are on soils of a light, sandy texture, though attacks may also be induced on heavier soils by unduly deep ploughing or ploughing in pasture grasses. Little is known about the distribution and concentration of take-all inoculum in the soil, but it seems highly probable that the scattered patches of seedling infection are due to localized soil contamination with the fungus. Epidemics of take-all are then liable to occur when there is showery weather leading to ascospore discharge from these early infections during the growing period ; conversely, in seasons with a fine, dry spring the incidence of the destructive whitehead phase of the disease is low.

Under laboratory conditions ascospore discharge usually began 10 to 30 minutes after moistening the fragments of leaf sheaths bearing perithecia, each of which ejected asci at the rate of 2 to 10 per minute for one to two hours. A piece of tissue about $\frac{1}{8}$ in. sq. bearing six perithecia ejected spores at the rate of over 100 per minute for more than an hour. The same method of spore ejection was observed in the field on perithecia-bearing culms moistened with rain water. As they are discharged, the ascospores may be carried away by air currents. Since the asci in the perithecia of *O. graminis* do not all ripen simultaneously, ascospore discharge probably takes place from the same perithecium several times in succession during a rainy season. The longevity of the ascospores was found to extend from three or four days under dry conditions to a week in a humid atmosphere at 12° C., the approximate mean temperature in the field during a wet spring.

SCHADE. **Aus der Praxis der Genossenschaftsbeizung.** [A note on co-operative disinfection in practice.]—*Nachricht. über Schadlingsbekämpf.*, viii, 3, pp. 118-120, 1933.

In the Wurzen [Saxony] agricultural co-operative district, covering an area of some 20,000 hect., the occurrence of heavy infection by wheat bunt [*Tilletia caries* and *T. levis*], *Fusarium* of rye, barley stripe [*Helminthosporium gramineum*], or loose smut of oats [*Ustilago avenae*] is stated to be quite exceptional. The virtually complete control of these diseases is attributed to the joint efforts of the co-operative agricultural union and the experimental 'ring' during the past ten years [cf. *R.A.M.*, xi, p. 36]. The proportion of treated seed-grain increased from 50 per cent. in 1927 to 84 per cent. in 1932. The disinfection is carried out with a Neuhaus-Eberswalde dusting machine [ibid., xii, p. 430] and (since 1930) with a short disinfection apparatus. Nearly all the 1,000 members of the co-operative union make use of these facilities with the above-mentioned excellent results. In two cases of severe bunt infection investigated in 1932 the causes were found to lie in failure

to procure clean seed for the last few years and in the use of the wholly unreliable sprinkling treatment.

OBERTREIS. **Die Bekämpfung der Streifenkrankheit der Braugerste.** [The control of stripe disease of malting Barley.]—*Nachricht. über Schädlingsbekämpf.*, viii, 3, pp. 121–124, 1 fig., 1933.

Very promising results have been obtained of recent years in the Rhine Province by the treatment of barley seed-grain against stripe disease (*Helminthosporium gramineum*) with ceresan [*R.A.M.*, xii, p. 16], and a concerted effort is being made by the co-operative agricultural-experimental 'ring' [cf. preceding abstract] to introduce routine disinfection by this method through the local breweries.

MUSKETT (A. E.) & CAIRNS (H.). **The effect of seed disinfection upon the Oat crop.**—*Journ. Min. Agric. Northern Ireland*, iv, pp. 105–115, 1933.

The salient features of this tabulated account of the writers' three years' experiments in Northern Ireland on the disinfection of oat seed-grain against the loose and covered smuts (*Ustilago avenae* and *U. kolleri*) have already been summarized from another source [*R.A.M.*, xii, p. 211]. It is claimed by G. O'Brien and E. G. Prentice that the improvement in the condition of oat crops treated with organic mercury compounds in Scotland is due to the control of leaf stripe (*Helminthosporium avenae*) [ibid., ix, p. 771], but the writers' observations in Ireland suggest that these compounds act as general disinfectants during the early stages of germination, *H. avenae* being only one of the injurious factors which they eliminate.

PIACCO (R.). **Ipertrofia ed anomalie dell' inflorescenza maschile del Mais causata dal carbone.** [Hypertrophy and anomalies of the male inflorescence of Maize caused by smut.]—*Giorn. di Risicolt.*, xxiii, 8, pp. 177–181, 3 figs., 1933.

A note is given on the hypertrophy and other abnormalities of the male inflorescences of maize produced in Italy by smut (*Ustilago maydis*) [*U. zeae*: *R.A.M.*, xii, p. 563].

MÜLLER (A. S.). **Observations and notes on Citrus diseases in Minas Geraes, Brazil.**—*Phytopath.*, xxiii, 9, pp. 734–737, 1933.

Notes are given on the following diseases affecting the newly established citrus plantations in Minas Geraes, Brazil. Sweet oranges and grapefruit are liable to a gum disease resembling mal di gomma. At the Agricultural College, a similar disease caused 31 and 19 per cent. infection, respectively, in two blocks of 600 and 1,000 one-year-old Rangpur lime seedlings. In 1931 the percentages of infection on rough lemon, Rangpur lime, sweet orange, shaddock [thick-skinned pomelo], and sour orange [*Citrus aurantium* var. *bigaradia*] stocks were 29, 26, 26, 17, and 19, respectively, the corresponding figures for 1932 being 23, 19, 19, 11, and 6. A species of *Phytophthora*, probably *P. parasitica* [*R.A.M.*, xii, p. 212], was isolated from a number of the affected seedlings.

A species of *Fusarium* was observed spreading as a thin, whitish

web over the upper, partly or wholly exposed roots of tangerine trees, the infection extending to the base of the trunk. The perithecia of a *Nectria* were also found in profusion in the cracks of infected bark, which readily shreds off. Possibly the disease is a form of dry root rot.

Damping-off of Rangpur lime and rough lemon seedlings, associated with species of *Fusarium* and *Pythium*, caused losses in two consecutive years in Vicosa of 15 and 5 per cent.

Scab [*Sporotrichum citri* or *Sphaceloma fawcettii*: ibid., xii, p. 689] may be regarded as a major disease, causing moderate to heavy infection of the Genoa, rough, and sweet lemons, King tangerine, West Indian and Rangpur limes, and bitter-sweet oranges (100 per cent. on the two last-named) in nursery rows; no mature Rangpur lime has been seen without severe scab on the leaves, twigs, and fruit.

Melanose [*Diaporthe citri*: ibid., xiii, p. 26] occurs mostly in old, closely planted seedling orange patches, and was also found on Marfim lemons.

Several distinct forms of *Colletotrichum gloeosporioides* appear to be associated with a mild type of anthracnose on grapefruit, shaddock, Rangpur lime, sweet orange, and sweet and Genoa lemons, the leaves, twigs, buds, flowers, and fruit being involved.

Septobasidium albidum [ibid., x, p. 654] is very difficult to remove from the peduncle end of the fruit in packing. An apparently different species of *Septobasidium*, not necessarily connected with insects, forms thin, brownish-red plates on the fruit, twigs, and leaves, which it may bind together.

A leaf spot associated with a *Phyllosticta*, resembling *P. hesperidearum*, has been observed on old, neglected orange trees, while *Ascochyta citri* has been found on seedling grapefruit, causing spotting, yellowing, and dropping of the leaves.

Aspergillus niger, *Alternaria* sp. on Satsuma oranges [*Citrus nobilis* var. *unshiu*] and lemons, and a species of *Fusarium* on limes are minor agents of fruit rot, the chief causes of which in Minas Geraes are *Penicillium italicum*, *P. digitatum*, and *Oospora citri-aurantii*.

Scale insects of citrus are parasitized throughout the year by *Cephalosporium lecanii* [ibid., ix, p. 33], *Tuberculoria coccicola*, *Myriangium duriaei* [ibid., vi, p. 419], *Podonectria* sp., and *Microcera* sp. [ibid., x, p. 554].

FAWCETT (H. S.). **New information on psorosis or scaly bark of Citrus.**—*California Citrograph*, xviii, 12, p. 326, 1933.

A hitherto unrecognized symptom associated with psorosis of citrus [*R.A.M.*, xii, p. 89] in California was observed in May, 1932, namely, a mosaic-like spotting of the foliage. Taken in conjunction with the data from budding experiments and other observations, this discovery suggests that the disease may be partially or entirely due to a virus. Small, light-coloured areas develop on very young, rapidly growing leaves, chiefly near the smallest veinlets, of which and of the adjacent tissue there appears to be a clearing. The stippled effect disappears as the leaves reach maturity, to be replaced in some cases by clear, approximately circular spots

with raised corky pustules or rings at the centre. A series of 23 ten-year-old Valencia orange trees, propagated from buds off psorosis-infected branches, all show mosaic symptoms on the leaves, accompanied in 14 by the typical features of the disease on the bark. No mosaic symptoms have developed, on the other hand, on the leaves of 11 trees budded at the same time from healthy individuals, and only one shows a single bark lesion.

CASELLA (D.). **Un tumore prodotto da Bacterium tumefaciens Smith e Town. su Arancia ovale e la selezione gemmaria.** [A tumour caused by *Bacterium tumefaciens* Smith & Towns. on an oval Orange, and bud selection.]—*Ann. R. Staz. Sper. di Fruttic. e di Agrumic.*, Acireale, N.S., i, pp. 43–45, 1 pl., 1933.

A green, irregularly warted lateral outgrowth [shown in the photograph reproduced to be rather more than half the diameter of the fruit in length], which was seen by the author on an otherwise entirely normal, orange-yellow, smooth-skinned oval orange from Calabria, was found in longitudinal section to have been caused by the proliferation, attributed to the action of *Bacterium tumefaciens*, of the mesocarp, and to consist internally of a white, spongy parenchyma with round or fusiform cells, traversed by numerous fibro-vascular bundles sparsely lignified and anastomosing; on the outside it was covered with a pericarp identical with that of the fruit itself. So far as he is aware, this is the first record of a crown gall tumour on citrus fruits, apart from a recent description by P. C. Shamel (*U.S. Dept. of Agric. Tech. Bull.* 123, 1929) of what is believed to have been an identical formation on a Washington navel orange, but which was interpreted by Shamel as a bud variation.

BENTON (J.) & POWELL (T. N.). **Removing Bordeaux spray from Oranges. Immersion in hydrochloric acid proved efficient and economical.**—*Agric. Gaz. New South Wales*, xliv, 9, pp. 683–684, 1933.

The Bordeaux oil spray (6–4–80–$\frac{1}{2}$) commonly applied for the control of black spot of Valencia oranges [*Phoma citricarpa*: *R.A.M.*, xi, p. 450] in New South Wales was found to be readily removable by 30 seconds' immersion of the fruit in $\frac{1}{8}$ to 2 per cent. hydrochloric acid, the latter strength also being efficacious in $7\frac{1}{2}$ seconds. No sign of injury to the fruit so treated was apparent after three weeks' storage, and a very bright colour characterized them. No further advantage was derived from additional dippings in 1 per cent. sodium chloride or sodium sulphate, the latter in fact tending to dull the vivid colour of the acid-treated fruit. The commercial hydrochloric acid costs 5*s.* to 6*s.* per gall. and is diluted $2\frac{1}{4}$ pints in 10 galls. water to give a 1 per cent. solution.

STREETS (R. B.). **Heart rot of the Date Palm.**—*Arizona Agric. Exper. Stat. Tech. Bull.* 48, pp. 443–469, 10 pl., 4 figs., 1933.

A full account is given of a previously undescribed heart rot of the date palm (*Phoenix dactylifera*) observed by the author in the Yuma Valley district of Arizona and California in 1925 and

ascertained to be due to *Thielaviopsis* [*Ceratostomella*] *paradoxa* [cf. *R.A.M.*, xi, p. 509]. The same disease was also found on *P. canariensis*, *Washingtonia filifera*, and *Erythea edulis*, and it probably attacks other species of palms [ibid., vi, p. 144; viii, p. 563].

The affected trees first showed a retarded development of the new leaves which made the crown appear as if flattened; the individual pinnae died out progressively towards the midrib, the older leaves being attacked first. Soon all the foliage became affected and the palms rapidly succumbed. The most conspicuous symptoms were present in the trunk, where the affected areas passed progressively through various shades of yellow and brown until they became almost black. The pith was completely disintegrated, but the vascular bundles were not noticeably affected.

Only trees previously weakened were attacked, those most susceptible being palms whose normal crown of leaves had been removed or greatly reduced in efforts to eradicate scale insects, without any corresponding reduction in the water supply to the roots. The fungus usually passed into the tree through the roots, the trunk being entered near soil level; sometimes entry was effected through wounds caused by mechanical injuries or through injuries made in removing offshoots from the base of the palm near soil level. Weakened trees died a few days after the disease became apparent, but in vigorous or resistant palms infection frequently became arrested.

Control depends on the destruction of all diseased palms and on improved cultural and sanitary methods. The disease is not a serious menace to well-managed orchards.

A bibliography of 31 titles is appended.

NEAL (D. C.), WEBSTER (R. E.), & GUNN (K. C.). **Growth of the Cotton root-rot fungus in synthetic media, and the toxic effect of ammonia on the fungus.**—*Journ. Agric. Res.*, xlvii, 2, pp. 107–118, 2 pl., 3 figs., 1 graph, 1933.

The results of the experiments reported in this paper showed that the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 691] made abundant growth in synthetic media containing calcium, sodium, or potassium nitrates as a source of nitrogen, while in the presence of equivalent doses of ammonium nitrate or ammonium sulphate, very little growth appeared at the end of 11, 18, and 31 days, respectively. The apparent toxic effect of ammonia on the fungus was confirmed in tests, in which the mycelium was killed after 20 minutes' exposure to ammonium hydroxide at a concentration as low as 500 parts per million, and by exposure for 30 seconds to the gas liberated from a 28 per cent. solution of ammonia in water. The latter also inhibited germination of *P. omnivorum* sclerotia after exposures as short as 10, 15, and 20 seconds, and the sclerotia were killed in 5 minutes by a 1 per cent. solution of ammonium hydroxide. In field tests a 6 per cent. solution of ammonium hydroxide applied to the soil around the roots of infected adult cotton plants killed the mycelium in most cases, without appreciable damage to the host, but the latter suffered severely from the effect of an 8 per. cent. solution.

The paper terminates with a brief discussion of the bearing of these findings on the possibility of controlling the disease by continued applications of barnyard manure or of ammonia or ammonium compounds, and also of protecting ornamental plants against attacks by the fungus in a similar manner.

ESTIFEYEFF (P. G.). К материалам по изучению болезни „корневая" гниль в условиях Средней Азии. [Contribution to the study of 'root rot' of Cotton under Central Asiatic conditions.] —39 pp., 19 figs., Scient. Res. Inst. for Cotton Growing and for the Cotton Industry, Scient. Ser., Tashkent, 1930.

This is a detailed report of the author's preliminary investigation of a damping-off of cotton seedlings, chiefly at the two-leaf stage, which is stated to be very prevalent in certain seasons over the whole of Russian Central Asia. The results disproved Zaprometoff's statement [*R.A.M.*, vii, p. 374] that this condition, which was described by him under the name 'root rot', is due to mechanical injury to the collar and stem of the seedlings, followed by invasion by certain saprophytes, or is caused by *Rhizoctonia crocorum* [*Helicobasidium purpureum*], the last-named fungus never having been found in diseased material. The term 'root rot' is also misleading, since in by far the greater part of the affected seedlings examined, the root system remained healthy, the chief symptom consisting in the development of dry cankers on the collar of the stems, which were more or less completely girdled, the death of the plants being caused by the destruction of the cortical tissues. The lesions were never seen to penetrate the xylem, which showed no discoloration. The term collar necrosis is considered to be more descriptive of the condition. Cotton seedlings beyond the two-leaf stage appear to be more resistant to the disease, and a fair proportion of those attacked were observed to recover.

The condition was found to be caused by a number of parasites, the most frequent among which (114 out of 218 cases investigated) was *Moniliopsis aderholdi*, which is very widespread in Central Asia, where it has been recorded on *Hibiscus esculentus*, *H. cannabinus*, *Abutilon avicennae* [ibid., xi, p. 183], and groundnut. Mites and insects were found to further the attack by this fungus, a full description of which is given, followed by an English diagnosis. Next in frequency of incidence (70 out of 218) were *Fusarium vasinfectum* [ibid., xi, p. 316], *F. buharicum* [ibid., ix, p. 380], and other species of this genus, while an undetermined species of *Verticillium* was found in 16 cases, causing collar cankers of a somewhat lighter colour than those induced by *M. aderholdi*.

PAILLOT (A.). **L'infection chez les insectes. Immunité et symbiose.** [Infection among insects. Immunity and symbiosis.]—535 pp., 279 figs., Trévoux, 1933.

This book, which contains many original illustrations, is divided into seven parts, of which the first four deal with the diseases caused by protozoa, fungi, viruses, and bacteria; the fifth with antibacterial immunity; the sixth with the phenomenon of bacterial symbiosis in aphids; while the seventh sets forth all the economic consequences of the investigation of infectious pathology among

insects, with special reference to the role of the latter in the transmission of infective agents and to the utilization of microbial parasites in the campaign against agricultural pests [see above, p. 77].

NATTRASS (R. M.). **Preliminary notes on some entomogenous fungi in Egypt.**—*Tech. & Sci. Service (Bot. Sect.) Min. of Agric., Egypt. Bull.* 120, 9 pp., 6 pl. [3 col.], 1932. [Received August, 1933.]

Notes are given on the following entomogenous fungi observed in Egypt: an organism identical with, or closely allied to, *Empusa grylli* [*R.A.M.*, viii, p. 380] on *Euprepocnemis plorans*, an *Empusa* with smaller conidia on *Prodenia litura*, *Aspergillus flavus* (group species) on *Pseudococcus sacchari*, *Beauveria bassiana* [ibid., xi, p. 299] on *Anacridium aegyptium*, and the small-spored strain of *Metarrhizium anisopliae* [ibid., xi, p. 782] as well as an undetermined *Mucor* on *Anacridium* (*Orthacanthacris*) *aegyptium*.

AVERNA-SACCÁ (R.). **Um entomophago cryptogamico do Caconema radicicola (Greef) Cobb (Fusarium mauroi n. sp.).** [A cryptogamic entomophage of *Caconema radicicola* (Greef) Cobb (*Fusarium mauroi* n. sp.).]—*Rev. Agric.*, [Brazil], viii, 3–4, pp. 93–101, 4 pl., 1933.

The eggs, larvae, and adults of *Caconema* [*Heterodera*] *radicicola* [*H. marioni*] parasitizing the root system of coffee and other plants in Brazil were found to be attacked by a species of *Fusarium* considered to be new and named *F. mauroi*. The fungus is characterized on potato, bread, or carrot agar at 25° C. by circular, white or faintly ashen, cottony or powdery colonies. The hyphal cells are 96 to 111 μ long by 3·5 to 4·5 μ broad. The falcate or clavate, occasionally straight, 1- to 5-septate conidia, measuring 29·6 to 62 by 4·8 to 9·3 μ, are borne at the tips of short conidiophores, with broad bases but tapering towards the apices, produced in clusters on the hyphae. Continuous, oval or elliptical microconidia, 8 to 22·2 by 3·2 to 5 μ in diameter were also produced. After 14 days on potato agar obclavate, conical, or cylindrical sporodochia were formed, the conidia from which measured 118 to 134·5 by 11 to 12·8 μ and had 6 to 10 (generally 8) septa. Concentric zones of alternating pale yellow and pink develop in colonies on nutrient agar. Sporodochia failed to form in carrot agar cultures kept in darkness.

CHIAPPELLI (R.). **Indagini sperimentali sulle cause d'infezione di dermatomicosi saprolegniacea nella Carpa.** [Experimental studies on the cause of infection by saprolegniaceous dermatomycosis in the Carp.]—*Giorn. di Risicolt.*, xxiii, 8, pp. 169–173, 2 figs., 1933.

Extensive damage is stated to be caused to carp in Italy by a fungus belonging to the Saprolegniaceae, and the writer makes some recommendations for the avoidance of the disease by strict attention to the sanitation of the basins and suitable methods of rearing. Disinfection of the fish with permanganate of potassium (1 in 200,000 for 20 minutes) gave promising results on a small scale.

TAKAHASHI (S.). **Experimentelle Untersuchungen über Coccidioides immitis.** [Experimental investigations on *Coccidioides immitis.*]—*Arch. für Dermatol.*, clxviii, 3, pp. 597–610, 6 figs. (1 col.), 1933.

A full account is given of the writer's inoculation experiments with *Coccidioides immitis* [*R.A.M.*, xii, p. 692] on guinea-pigs at Sapporo, Japan, and of his morphological studies on the fungus.

The sites most commonly attacked were found to be the liver, pancreas, genital region, lymphatic glands, lungs, and spleen. The fungus was readily identified in the tissues by a modified carbol fuchsin-methylene blue staining method. On artificial media *C. immitis* forms intercalary or terminal, thick-walled, globular, mostly septate chlamydospores, 5 to 20 μ in diameter; on subculturing, these bodies produce a mycelium and a mycelium also developed from the germinating 'endospores' occupying the asci, a new observation so far as the writer is aware [but see ibid., xii, p. 170]. Of the three kinds of double-contoured structures observed in the animal body, only the endospores remain in the later stages of the disease.

MOORE (M.). **A study of Endomyces capsulatus Rewbridge, Dodge and Ayers: a causative agent of fatal cerebrospinal meningitis.**—*Ann. Missouri Bot. Gard.*, xx, 3, pp. 471–552, 8 pl., 2 figs., 2 diags., 13 graphs, 1933.

Clinical details are given of cases of human diseases from which were isolated the fungi *Endomyces capsulatus*, *E. capsulatus* var. *isabellinus*, *E. dermatitidis* [*R.A.M.*, xii, p. 441], and a fungus (probably identical with the last named) was also received from a case of blastomycosis or generalized torulosis in Austria (*Arch. für Dermatol.*, clxii, p. 401, 1930). The present study is concerned primarily with *E. capsulatus*, but the observations are also generally applicable to its variety *isabellinus* and to *E. dermatitidis*.

Two life-cycles were found to occur in *E. capsulatus*: one in the parasitized host as a budding yeast cell; and the other in culture representing a perfect Ascomycete, with asci ranging from 7 to 14 μ in diameter according to the medium and containing 8 ascospores 2 to 2·5 μ in diameter. The asci may arise from the copulation of two hyphal cells or by parthenogamy, in which spore production takes place without preceding copulation.

Full details are given of the cultural characters of *E. capsulatus* on numerous media. Slender hyphae and abundant conidia develop on acid media and thick-walled, shorter cells on alkaline substrata. After four years of subculturing the minimum, optimum, and maximum temperatures for the growth of the fungus on beet extract agar were 8°, 25°, and 37° C., respectively, the corresponding hydrogen-ion concentrations being 3·3, 7·4, and 9·3, respectively. The colony diameter in 30 days at P_H 6·1 and 8·2 was 6·8 cm. compared with 8·1 cm. at the optimum, P_H 7·4. In the yeast form *E. capsulatus* may show facultative anaerobiosis, but growth on an artificial medium converts it into a strict aerobe. Gelatine is liquefied in 30 days. The organism was shown, by inoculation experiments on laboratory animals, to have lost its virulence after a four-year period of subculturing.

WOLFRAM (S.) & ZACH (F.). **Über einige durch niedere Pilze verursachte Nagelerkrankungen beim Menschen.** [On some nail diseases of man caused by lower fungi.]—*Arch. für Dermatol.*, clxix, 1, pp. 95–104, 6 figs., 1933.

Latin and German diagnoses are given of *Blastodendrion* [*R.A.M.*, xi, pp. 477, 642] *globosum*, *B. oosporoides*, and *B. gracile* n. spp., isolated from nail affections in Vienna. On maltose agar *B. globosum* is characterized by globular cells, mostly 5 to 5·5, but in some cases up to 12·8 μ, in diameter. The ovoid or more rarely globular cells of *B. oosporoides* measure 7·5 to 9·7 by 4·9 to 6·5 μ. *B. gracile* is characterized by cells of very variable shape and dimensions, being either globular (2·7 to 3·2 μ in diameter), ovoid to oval (mostly 6·5 by 5·4 μ), or elongated (6·5 to 19·5 by 2·5 by 3·2 μ). All the species grew well at 37° C. and liquefied gelatine; *B. oosporoides* was the only one capable of fermenting glucose and levulose.

The clinical conditions induced by the fungi under discussion are fully described.

PODWYSSOTZKAJA (O. N.) & ROSENTHAL (S. K.). **Über Trichophytose. (Beitrag zur Kenntnis der chronischen Trichophytie der Erwachsenen.)** [On trichophytosis. (A contribution to the knowledge of chronic trichophytosis of adults).]—*Arch. für Dermatol.*, clxviii, 3, pp. 572–585, 4 figs., 1933.

A full account is given of the writers' studies on chronic trichophytosis of adults in Russia (Leningrad and Minsk) from the clinical, mycological, histological, epidemiological, diagnostic, prophylactic, and therapeutic standpoints. The disease was found to be almost exclusively confined to women and to be due in the majority of the 60 cases examined to *Trichophyton violaceum*, while *T. crateriforme* [*R.A.M.*, xii, p. 510], *T. gypseum*, and *Achorion schoenleini* were very occasionally involved.

DAVIDSON (A. M.) & GREGORY (P. H.). **Kitten carriers of Microsporon felineum and their detection by the fluorescence test.**—*Canadian Med. Assoc. Journ.*, xxix, 3, pp. 242–251, 3 figs., 1933.

Over half the number of cases of ringworm investigated at Winnipeg were found to be due to *Microsporon audouini* [*R.A.M.*, xii, pp. 23, 693], but the apparent predominance of this organism is partly attributable to its spread among the inmates of an orphanage. Actually two-thirds of the separate outbreaks were traceable to *M. felineum*, and in about half this number evidence was available that infection was contracted from a cat or dog [ibid., viii, p. 576; x, p. 731].

Clinical details and experimental data are furnished in connexion with a case of infection by *M. felineum* in a boy, on whom the first lesions appeared two to three weeks after he had been given an apparently healthy kitten. However, the examination of the latter under the ultra-violet light passing a filter of Wood's glass revealed the presence of fluorescent hairs infected by *M. felineum*. While undergoing treatment, the patient was given a healthy kitten, which in three to four weeks developed typical ringworm, evidently

transmitted by the boy. A third kitten was artificially inoculated in the ear with *M. felineum*. After the resulting lesion had healed, a few fluorescent, infected hairs remained round the eyes for three months, during which period the animal is considered to have been a potential ringworm carrier.

The extension of the fluorescence test to include pet animals is advocated as a practical prophylactic measure against ringworm.

TOMKINS (R. G.). **Mycology. The inhibition of the growth of meat-attacking fungi by carbon dioxide.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 48–50, 1933.

When the spores of the meat moulds *Thamnidium chaetocladioides*, *T. elegans*, *Mucor mucedo*, *Cladosporium herbarum*, and *Sporotrichum carnis* were exposed to known amounts of carbon dioxide at constant temperatures [*R.A.M.*, xi, p. 574], the latent period of germination was increased and the rate of elongation of the germ-tube decreased (the tube at the higher concentrations being short and much branched); spore germination was reduced only in concentrations which noticeably prolonged latency and reduced the rate of elongation of the germ-tubes. The growth of the colonies was retarded and the rate of spread (which at given concentrations and temperatures remained constant over long periods) reduced. The concentrations required completely to inhibit growth were, in the first four fungi named, about 30 to 40 per cent. at 15°, 20 to 30 per cent. at 10°, about 20 per cent. at 5°, and 10 to 20 per cent. at 0° C. With *S. carnis* over 30 per cent. of carbon dioxide was required to inhibit growth at 5°.

When spores of the same organisms (except *M. mucedo*) and also of *Mucor* sp., *Penicillium* sp., and *Dematium pullulans* were exposed on agar surfaces to atmospheres containing 99 per cent. carbon dioxide for 17·5, 27, 43, and 66 hours and then removed to air, no obvious differences became apparent in the time required for germination, nor was there any noticeable reduction in percentage germination. Brief exposures to high concentrations of carbon dioxide would not, therefore, appear to be a useful variation of gas storage for the prevention of mould on meat.

BISBY (G. R.), JAMIESON (M. C.), & TIMONIN (M.). **The fungi found in butter.**—*Canadian Journ. of Res.*, ix, 2, pp. 97–107, 1933.

The fungi most frequently isolated from 858 samples of butter examined in Manitoba in 1932 were *Alternaria* sp., *Oospora lactis*, *Mycoderma* spp., and *Phoma hibernica* [*R.A.M.*, xii, p. 24]. The *Alternaria* produces a particularly objectionable dark growth in butter. Other prevalent organisms were *Penicillium chrysogenum* [ibid., xi, p. 325], *P. terrestre* (both common in soil), three species of *Phoma* with spores measuring 4 by 1, 4 to 7 by 3, and 7 to 11 by 2 to 3 μ, respectively, *Paecilomyces varioti* or *Penicillium divaricatum* [ibid., ix, pp. 215, 316], and *Cladosporium herbarum*.

From a table showing the 104 moulds recorded in butter by (*a*) H. Macy (*Minnesota Agric. Exper. Stat. Tech. Bull.* 64, 1929), (*b*) M. Grimes *et al.* [*R.A.M.*, x, p. 242], and (*c*) the present writers, it appears that only three are mentioned in all the papers cited, namely, *A.* spp., *C. herbarum*, and *O. lactis*. The last named is

ubiquitous in milk, while the two others are common on plant refuse. It is thought probable that nearly all the moulds affecting butter originate in the soil, on plant débris, or in manure. About half of the 65 fungi identified in Manitoba butter were also isolated from the local soils [ibid., xii, p. 534]. The moulds may be destroyed by pasteurization, but subsequent to this process extreme vigilance is necessary for their exclusion from the cream or butter. Parallel inoculation experiments on salted and unsalted butter showed the high protective value of salt, which should be added to all consignments intended for lengthy storage or overseas transport. Other factors promoting freedom from contamination are low temperature and low humidity.

SHCHEPETILNIKOVA (A. M.). **Chloropicrin as a means of combating weeds and Flax sickness in soils.**—*Chemisation Socialistic Agr., 1933,* 2, pp. 128–135, 1933. [Abs. in *Chem. Abstracts,* xxvii, 22, p. 5879, 1933.]

Chloropicrin [*R.A.M.,* iii, p. 552] was found to be a very effective remedy for 'flax sickness' in Russian soils, decreasing the number of the fungi involved [e.g., *Fusarium lini, F. russianum, Colletotrichum lini,* and *Alternaria* sp.: ibid., xii, p. 220] and augmenting the bacterial flora. The disinfectant was applied at the rate of 0·013 to 0·28 gm. per kg. of soil in pots and up to 20 gm. per sq. m. in the field. The effects of the treatment persisted into the second year.

MUSKETT (A. E.) & TAYLOR (J. C.). **Diseases of the Rose. The control of Rose rust by summer spraying.**—*Journ. Min. Agric. Northern Ireland,* iv, pp. 62–66, 1933.

A tabulated account is given of the writers' experiments in Northern Ireland in 1932 on the control of rose rust (*Phragmidium mucronatum*) [*R.A.M.,* xii, p. 194] by four applications (18th and 25th August, 8th and 17th September) of the following fungicides: (1) bouisol [see below, p. 121] and soft soap, 0·5 oz. of each per gall.; (2) Bordeaux mixture (1·5 oz. copper sulphate and 1 oz. unslaked lime per gall.); (3) liver of sulphur and soft soap (0·33 or 0·66 oz. and 0·5 oz., respectively, per gall.); and (4) sulsol [ibid., xi, p. 587] and soft soap (1 and 0·5 oz., respectively, per gall.). The varieties used were the susceptible Lady Pirrie, Mrs. Henry Morse, and Margaret McGredy budded on *Rosa canina* stock. Of the four treatments the last gave the best results (77·2 per cent. rust-free leaves compared with 31·4 and 24·6 per cent., respectively, in two control plots). Bordeaux mixture and bouisol also gave quite satisfactory control (75·4 and 73·9 per cent. healthy leaves, respectively), but both caused unsightly markings or discoloration, while liver of sulphur failed to check the disease adequately.

BORDAS (J.), JOËSSEL (P. H.), & ANRÈS (É.). **Enquête sur les dépérissements de la Lavande.** [Inquiry into the wilts of Lavender.]—*Ann. des Épiphyties,* xviii, 6, pp. 368–383, 1932. [Received November, 1933.]

During the past ten years a wilt of lavender [cf. *R.A.M.,* xi, p. 375] which has become prevalent in the south-east of France has

caused the abandonment of certain plantations. Dead or wilting plants are scattered among healthy ones over large areas, and in certain localities the mortality due to the condition is increasing. The disease progresses slowly, the oldest branches succumbing first, but frequently being replaced by shoots which develop abundantly near the collar. The stems or main pivotal roots show discoloured areas corresponding with the affected branches. Finally, a wet rot, probably due to secondary saprophytes, sets in.

No symptoms characteristic of attack by any soil-inhabiting fungus were observed and no one fungus was constantly present, only probably saprophytic or weakly parasitic organisms being noted. In one instance *Armillaria mellea* was found on a hybrid between *Lavandula vera* and *L. latifolia* growing where a vine had previously died from root rot [ibid., ix, p. 360].

The condition is probably associated with unsatisfactory soil or cultural factors in recently established plantations.

FAJARDO (T. G.). **Sclerotium stem rot of Delphinium and other ornamental plants in Trinidad Valley, Mountain Province, Philippine Islands.**—*Philipp. Journ. of Sci.*, li, 4, pp. 447–453, 1933.

In May, 1932, annual delphiniums in Trinidad Valley, Mountain Province, Philippine Islands, were found to be severely attacked (5 to 10 per cent. infection) by *Sclerotium rolfsii*, apparently not hitherto recorded on this host in the country, but widely distributed there on a number of other garden and ornamental plants and also the cause of a stem and root rot of beans (*Phaseolus vulgaris*) and tomatoes. Inoculation experiments with the fungus gave positive results on delphinium, bean, and tomato. A comparative study of the Philippine delphinium organism with three strains of *S. delphinii* and with cultures of *S. rolfsii* from the United States [*R.A.M.*, xi, p. 785] established its identity with the latter and revealed differences from *S. delphinii* in the size, number, and markings of the sclerotia.

BRIERLEY (P.). **Dahlia mosaic and its relation to stunt.**—*Bull. Amer. Dahlia Soc.*, Ser. ix, 65, pp. 6–11, 19, 4 figs., 1933.

Cross-inoculation tests have shown that the conditions variously known in the United States as 'dwarf', 'rugose rosette', 'rugose mosaic', and 'veinal mosaic' are merely the divergent reactions of different dahlia varieties to mosaic, which is not, however, synonymous with 'stunt' [*R.A.M.*, xii, p. 697]. Definite evidence of mosaic is stated to have been detected in some 461 dahlia varieties. Notes are given on the transmissibility and control of the disease.

STAPP (C.). **Die Weissfäule der Hyazinthen.** [The white rot of Hyacinths.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 23–24, pp. 459–474, 3 figs., 1933.

Hyacinth bulbs sent from the Dutch Flower Bulb Investigation Institute for testing at the Biological Institute, Berlin-Dahlem, contracted white rot, originally described by A. Heinz (*Zentralbl. für Bakt.*, Ab. 2, v, p. 535, 1889) as due to *Bacillus hyacinthi septicus*, during the winter of 1930–1. The affected varieties were L'Innocence,

Gertrude, and Queen of the Blues, whereas Queen of the Pinks remained healthy. Subsequently the white rot was also observed on two plants from central Germany.

The most striking symptom of the disease is the rapid conversion of the infected tissues into a pulpy or viscous, malodorous mass. In most of the cases observed, the rot originated at soil level on the inflorescence axes of fully grown plants, the tissue of which darkened and became water-soaked; shortly afterwards the whole upper portion bearing the inflorescence fell over, infection spreading to the leaves and finally to the bulb scales. Occasionally the bulbs were attacked before or during the elongation of the shoot.

The causal organism is a rod measuring 1·6 to 2·8 by 0·6 to 0·7 μ, with peritrichous flagella, Gram-negative, forming transparent, white, glistening, smooth-edged colonies, liquefying gelatine, coagulating milk and litmus milk, making little growth in Uschinsky's and Fermi's solutions and practically none in Cohn's, reducing nitrates, producing no indol and leaving starch almost intact, utilizing arabinose, xylose, glucose, fructose, saccharose, lactose, raffinose, and mannite with acid and gas formation, and growing best with peptone or asparagin as sources of nitrogen. The minimum temperature range for its development was –1° to 2.8°, the optimum 23° to 25·6°, and the maximum 36° to 38°. Details are given of the cultural characters of the organism on a number of standard media.

Positive results were given by inoculation experiments on all the above-mentioned hyacinth varieties, showing that Queen of the Pinks, though relatively resistant, is not immune, while L'Innocence was the most susceptible. The symptoms developed more rapidly at 27° than at 22°. Other plants reacting positively to inoculation with the hyacinth pathogen were potatoes (shoots and tubers), tomatoes, tobacco, beans [*Phaseolus vulgaris*], peas, lupins (*Lupinus mutabilis*), red and white cabbage, fodder beets, radishes, horse-radish, carrots, cucumbers, onions, gladiolus, and *Pelargonium zonale* (one strain of the bacterium only).

In its morphological, cultural, and physiological characters the hyacinth white rot organism corresponds in the main with *B. phytophthorus*, and agglutination experiments indicated its extremely close relationship with the fifth sub-group of this species, *B. carotovorus iris* Leach [*R.A.M.*, viii, p. 397]; it is placed in a new (sixth) sub-group of *B. phytophthorus*. The positive reaction of *P. zonale* to only one strain of the hyacinth organism agrees with the results obtained by P. Brierley in his inoculation tests with *B. phytophthorus* [ibid., viii, p. 195], so that the differential behaviour towards this plant of the various strains within the species may well serve as a diagnostic character.

Control measures should include storage in a dry, well-ventilated room, the bulbs being not in contact with one another; timely planting so that the bulbs are well rooted by forcing time; and the avoidance of excessively early forcing at high temperatures.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Fusarium wilt and corm rot of Freesias.**—*Bot. Gaz.*, xcv, 1, pp. 128–142, 25 figs., 1933.

Fusarium bulbigenum, *F. martii-minus*, *F. moniliforme* [*Gibbe-*

rella moniliformis], and *F. solani* were isolated from freesia corms infected by a destructive rot prevalent in California, Florida, and Indiana, and reproduced the disease in inoculation experiments. *F. conglutinans* from cabbage and *F. lycopersici* from tomato also produced the typical symptoms on inoculation into freesias, while five other species, viz., *F. batatatis* from sweet potato, *F. niveum* from watermelons, *F.* sp. from Panama wilt of bananas, *F. vasinfectum* from cotton, and *F.* sp. from decayed gladiolus corms, caused less severe injury to the corm plate and rootlets. Infection is conveyed by diseased corms and remnants of wilted plants, and through the soil.

F. solani and *F. martii-minus* caused a decay of inoculated onion bulbs, while *Gladiolus* corms planted in soil inoculated with these two species, *G. moniliformis*, and *F. bulbigenum* contracted a decay of the plates which prevented the development of new roots.

BROWN (J. G.) & EVANS (M. M.). **The natural occurrence of crown gall on the Giant Cactus, Carnegiea gigantea.**—*Science*, N.S., lxxviii, 2017, pp. 167–168, 1933.

Both aerial and root galls have been observed by the writers on the giant cactus (*Carnegiea gigantea*) in the mountain forests of Arizona, the former reaching a diameter of 2 ft. or more while one root gall, consisting of spongy parenchymatous tissue covered with greyish bark, weighed 8½ lb., measured 10 in. across, and had a short stalk 1½ in. thick. Small galls form lumps on the surface of the cactus, which may leave holes in the columnar trunk when the galls are 'abscissed' by a cork layer, while in other cases the growth of the tumours may be so rapid that the host fails to 'wall off' the enlarging cell mass. The organism isolated from the cactus galls was found to correspond with the peach and cottonwood [*Populus deltoides*] strains of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xii, p. 358]; inoculation experiments to confirm the identity of the pathogen are in progress.

Discussing the origin of crown gall on the cactus and other wild plants in Arizona, the writers are inclined to think, from the extent and location of the infections, that the pathogen is indigenous to the region.

JOHNSON (E. M.). **A ringspot-like virus disease of Red Clover.**—*Phytopath.*, xxiii, 9, pp. 746–747, 1 fig., 1933.

Kentucky, Oregon, Wisconsin, and French red clover (*Trifolium pratense*) strains at the Kentucky Agricultural Experiment Station showed, in September, 1931, small, irregular to circular, yellowish spots, a few mm. to 2 cm. in diameter, with well-defined necrotic borders, on the leaves, some of which were completely discoloured while the stems of certain plants also bore long, narrow, irregularly oval, yellow areas. The spots resembled those of yellow ring spot of tobacco [*R.A.M.*, xii, p. 473], a row of plants affected by which was growing a few feet from the clover. Negative results, however, were given by experiments in the transmission of the clover disease to 27 Turkish tobacco plants by rubbing the infective juice on their leaves, as well as by aphids, while garden beans (*Phaseolus vulgaris*) also failed to contract the symptoms on inoculation by

the former method. None of the 165 clover seedlings produced by 255 seeds from five plants showed any trace of the ring spot.

MAYOR (E.). **Relations entre les écidies de Euphorbia verrucosa Lam. et un Uromyces sur Vicia cracca L.** [The relations between the aecidia of *Euphorbia verrucosa* Lam. and a *Uromyces* on *Vicia cracca* L.]—*Bull. Soc. Sci. Nat. Neuchâtel.*, lvi, pp. 341–352, 1 fig., 1932.

Full details are given of the successful inoculation experiments conducted by the writer in the Jura mountains, Switzerland, with the teleutospores of a *Uromyces* from *Vicia cracca* on *Euphorbia verrucosa*, which commonly bears aecidia in nature. Conversely, the aecidia from *E. verrucosa* infected *V. cracca*. The fungus was found to differ from *U. fischeri-eduardi* and *U. genistae-tinctoriae*, the aecidia of which are formed exclusively on *E. cyparissias*, though resembling the former in various particulars, and is accordingly named *U. verrucosae-craccae* n. sp., with a Latin diagnosis. The pycnidia and aecidia of the organism have been described in the literature under the name of *U. excavatus* (DC.) Lév. The uredospores are globose or subglobose, yellowish-brown, 18 to 23 μ in diameter, furnished with 5 or 6 germ pores and sometimes with a minute, hyaline papilla; the teleutospores are brown, globose or subglobose, rarely ellipsoid, usually 19 to 23 by 18 to 20 μ, occasionally 18 to 28 by 16 to 21 μ, rounded at both ends, having an apical germ pore, frequently a minute (up to 3 μ), light brown papilla, and with a hyaline pedicel, up to 20, rarely 30, by 4 to 5 μ. This rust attacks the foliage, petioles, and stems of *V. cracca*, not only in Switzerland but also in Austria, Germany, France, Spain, and Italy.

McCOWN (M.). **Weak Bordeaux spray in the control of fire blight of Apple.**—*Phytopath.*, xxiii, 9, pp. 729–733, 1933.

Bordeaux mixture 1–3–50, applied early in the flowering period (beginning of May) to Grimes apple trees at Lafayette, Indiana, reduced the incidence of fireblight (*Bacillus amylovorus*) in the blossom clusters inoculated both immediately and 24 hours after spraying by about 50 per cent. in 1931. In 1932 only 10 per cent. of the sprayed clusters developed fireblight compared with 57 per cent. of the untreated controls. In 1930 natural infection in Jonathan clusters was reduced 67 per cent. by one application of 1–3–50 Bordeaux in the early stage of full bloom. The mixture caused no apparent injury to the foliage or fruit and the set of the latter was not reduced.

BOUMAN (ADRIANA M.). **Bestrijding van bacterielle wortelknobbels bij Appel en Peer.** [The control of bacterial root galls in Apple and Pear.]—*Tijdschr. over Plantenziekten*, xxxix, 9, pp. 217–224, 1933. [English summary.]

Satisfactory control of crown gall (*Bacterium tumefaciens*) on the roots of apple and pear seedlings was given in a Dutch nursery by the immersion of the young plants after cutting back in a thick paste consisting of 0·5 per cent. uspulun and about the same quantity of clay soil [*R.A.M.*, v, p. 694]. This treatment can be

applied at the low cost of Fl. 3·75 per hect. and is therefore to be generally recommended. Soil disinfection with uspulun (0·5 per cent., 10 l. per sq. m.) is a less reliable and much more expensive method. In a preliminary test to determine the relative susceptibility to crown gall of certain quince and Paradise apple stocks from East Malling, Kent, in heavily infested soil, the former appeared to be entirely immune while the latter varied in their reaction, type I appearing, from the very limited tests made, to be the most resistant [cf. ibid., xii, pp. 298, 639].

SWARBRICK (T.). **The spraying of farm orchards as a means of increasing the cider fruit crop.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 47–65, [1933].

In discussing the major problems relating to the spraying of cider apple orchards, particularly the economic aspect of disease control, the author gives brief practical directions for the control of various insect pests and of scab [*Venturia inaequalis*], based on the experience gained in commercial orchards. In the west of England spraying for disease control has not yet been widely adopted on farm orchards, which are regarded as merely subsidiary to general farming practice; furthermore, the trees are often very large and it is not essential that the fruit should be entirely unblemished.

Some details are given of the cost of spraying cider apple trees based on experience gained in the cider apple orchard at Long Ashton. It is concluded that the combined cost of winter washing for insect control and a single application of lime-sulphur against scab and red spider [*Oligonychus ulmi*] at the pink bud stage should not exceed 3*s.* 6*d.* per tree and in many cases may not be more than 2*s.* 6*d.* per tree. In a light crop year the scab spraying may be omitted or it may be found profitable to alternate winter washing with summer spraying in successive years.

KEARNS (H. G. H.), MARSH (R. W.), & PEARCE (T. J. P.). **Experiments with combined insecticide-fungicide sprays for Apples.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 66–85, [1933].

An account is given of some experiments with combined insecticidal-fungicidal sprays at Long Ashton, in which it was found that only slight scorching followed the use between the green flower and pink bud stages of 2 per cent. Shell P2 white oil emulsified with agral S.R., to which was added sufficient lime-sulphur to make a 3 per cent. lime-sulphur spray, and that scorching was not serious when the spray consisted of 5 per cent. oil and 3 per cent. lime-sulphur at the green flower stage, 2 per cent. oil and 3 per cent. lime-sulphur at late pink, and 2 per cent. oil with 1·5 per cent. lime-sulphur at petal fall. The varieties sprayed were Bramley's Seedling, Lane's Prince Albert, and Worcester Pearmain in the first series and the last-named only in the second.

In a preliminary trial with sprays designed to combine the post-blossom applications against scab [*Venturia inaequalis*] with nicotine, two sprays containing wetting agents more effective than soap and compatible with lime-sulphur were made up, consisting

of 1·5 galls. lime-sulphur, 8 oz. nicotine, and either 2·5 lb. agral I or 1 lb. 'lethalate wetting' per 100 galls. water. Nine Worcester Pearmain trees were sprayed on 7th June with 20 galls. of the first, and nine others with the same quantity of the second. No spray damage resulted, and the scab control obtained was not inferior to that observed on comparable trees sprayed with lime-sulphur only.

MARSH (R. W.). **Trials with a 'colloidal' copper spray fluid.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 86–89, [1933].

When Stirling Castle apple trees at Long Ashton were sprayed against scab [*Venturia inaequalis*: *R.A.M.*, xi, p. 112] midway between the green flower and pink bud stages and again on 18th June with bouisol (3 and 1·5 pints per 100 galls., respectively) [ibid., xii, p. 199 and below, p. 121], sufficient russeting developed to lower the commercial value of the fruit. Three Lane's Prince Albert trees given the same treatments remained entirely free from russeting, and gave 71 per cent. clean and slightly scabbed fruits as against 30 per cent. on the unsprayed controls. The absolute standard of control obtained was not, however, high, suggesting that while bouisol may safely be used as a post-blossom spray on this variety, better protection is necessary in the pre-blossom stage.

Requests having been received for a spray treatment against black currant leaf spot [*Pseudopeziza ribis*: ibid., viii, p. 656] which could be applied before picking without leaving an excessive deposit, French (relatively resistant) and Baldwin (susceptible) bushes planted in 1930–1 were sprayed on 14th June with bouisol, 1·5 pints per 100 galls. The crop, picked on 25th July, showed no perceptible spray residue. On 30th July, other bushes of the same varieties were given a post-cropping application of Bordeaux mixture 2–4–50 or bouisol 1·5 pints per 100 galls., and the results showed that bouisol was approximately as effective after cropping as Bordeaux mixture. The pre-cropping application of bouisol had little effect by the end of September, but as this spray leaves no visible residue it may prove to be of value as an adjunct to the standard post-cropping application of Bordeaux mixture.

GOODWIN (W.), MARTIN (H.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, p. 95–107, 1933.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xii, p. 101] conducted in Kent in 1932, Allington Pippin and Newton Wonder trees received two pre- and two post-blossom applications either of home-made Bordeaux mixture (8:12:100) or of an emulsion of 1 gall. of a crude expressed oil of mustard of high acid value (equivalent to 27·3 gm. oleic acid per 100 ml.) and 4 galls. of 10 per cent. copper sulphate in 95 galls. of water with 6 lb. hydrated lime. The oil emulsified readily, but a scum of copper and calcium soaps prevented the use of a strainer in the tank. This emulsion was tested because there was reason

to believe that it could be applied as a heavy wash [ibid., xii, p. 774], thus saving time; that, probably requiring less copper than Bordeaux mixture, it would obviate spray injury; and because similar vegetable oils have been found effective against hop powdery mildew [*Sphaerotheca humuli*: cf. ibid., xi, p. 253].

The results obtained [which are tabulated and fully discussed] showed that in the unsprayed Allington Pippin control plots the scab-free apples averaged 21 per cent. of the crop, the corresponding figures for the plots sprayed with Bordeaux mixture and the emulsion being, respectively, 94 and 89 per cent. In the Newton Wonder control plots the scab-free apples averaged 3 per cent. of the crop, the corresponding figures for the plots treated with Bordeaux mixture and the emulsion being 89 and 53 per cent.

The Allington Pippin trees sprayed with Bordeaux mixture showed 2·9 per cent. of the total crop and 3·1 per cent. of the grade 1 apples russeted, the corresponding figures for the trees sprayed with the emulsion being 1·6 and 1·9; with the Newton Wonder trees the figures were, respectively, 2·8, 3, 0·6, and 0·8 per cent., the russeting due to the emulsion being negligible.

That the emulsion gave a less satisfactory degree of control than the Bordeaux mixture on the Newton Wonder trees is attributed to its inferior fungicidal efficiency. Periodic determination of the amount of copper remaining on the foliage, allowance being made for leaf growth, demonstrated that on every occasion after blossoming more copper was present on the leaves sprayed with Bordeaux mixture than on those sprayed with the emulsion. The retention of the deposit did not appear to have been improved by the presence of the oil to the same extent as in other trials with a cheap cotton-seed oil of low acid value which formed only a negligible amount of copper-calcium soap. A better protective fungicidal action would probably have resulted if in the preparation of the emulsion the formation of copper soaps could have been avoided.

KENT (W. G.). **A commercial Apple-spraying demonstration in 1932.**—*Journ. Min. Agric.*, xl, 5, pp. 420–430, 1933.

The increase in the percentage of Bramley's Seedling apples free from scab [*Venturia inaequalis*] in a 6½ acre orchard near Maidstone, Kent, when sprayed four times with Bordeaux mixture (3¼–5–40 plus 26 oz. lead arsenate) on 19th April, 13th and 27th May, and 16th June, 1932, ranged from 51 to 65 in the different plots (87·9 to 94·9 per cent. clean apples compared with 28·9 to 37 in the controls), the corresponding figures for the lime-sulphur treatment (1⅓ in 40 galls., subsequently diluted to 1 in 79 plus lead arsenate and supplemented by a spreader) being 42 to 53. The total cost of the former treatment was £7 19*s.* 4*d.* and of the latter £10 7*s.* 8*d.*, exclusive of the allowance for the machinery, estimated at about 30*s.* per acre for the whole season. For the first and second applications four 10 ft. metal lances, with 'Mistifier Junior' nozzles fitted with No. 2 disks were used; in the third the Bordeaux mixture was applied through No. 0 disks and the lime-sulphur through an intermediate size between 2 and 3, while a new type of double nozzle, the 'Noblox', with No. 2 disks, was used with the Bordeaux mixture in the fourth spray. 'Merryweather'

portable pipes connected the rubber delivery hoses to the pump in the first three applications, but in the last the sprayer was drawn by a tractor. The Bordeaux-treated trees showed a dark purplish tinting of the foliage from August onwards, but the quality of the crop was not impaired.

BABEL (A.). **Schorfbekämpfung nach neuen Beobachtungen.** [Scab control on the basis of new observations.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 498–500, 3 figs., 1933.

The comparative examination of the foliage of 12-year-old apple trees sprayed against scab [*Venturia inaequalis*] about 12th May, 1933, at Opladen [Rhine] with (*a*) sulphur fungicides (lime-sulphur and solbar, 1 or 2·5 per cent.) and (*b*) copper mixtures (0·5 per cent. nosprasit 0 [*R.A.M.*, xii, p. 233] and a new compound at 2 per cent.) indicated the marked superiority of the latter preparations [cf. ibid., xii, p. 450]. The scab lesions were found to have been burnt away by the copper mixtures, whereas the sulphur preparations failed to prevent their extension. The burning action of the copper was particularly noticeable on the relatively resistant, late Zuccalmaglio, the scab spots on which were instantly killed by the treatment, whereas on other varieties, e.g., Lord Suffield and Canada Pippin, the effects were more gradual. The above-mentioned treatments were applied five days after the first trace of infection was detected on the early varieties, no sign being yet apparent on Zuccalmaglio, and it is suggested that this time should be regularly adopted as the starting-point of the spraying schedule. The incidence of storage scab [ibid., xii, p. 377] in a test by the writer on the Jacob Lebel variety in 1932 amounted to 34·9 per cent. after six weeks in the sulphur-treated fruit, compared with only 9·7 per cent. among the apples sprayed with copper compounds.

HORNE (A. S.). **Biological work on fruit.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 279–300, 3 pl., 2 diags., 5 graphs, 1933.

In investigations conducted in collaboration with Miss F. M. Carter on the pathogenic fungi present in the air of apple orchards [*R.A.M.*, xii, p. 32] more than 20,000 fungal and bacterial colonies were obtained on the exposed plates between 2nd May, 1930, and 17th September, 1931. The fungi identified at four localities are listed, and the estimated frequencies of 18 genera at two of them arranged in descending order.

In work with E. M. Eweis a special technique was devised to ascertain whether different apple-rotting fungi enter through the skin or through a lesion, and, in the former case, whether they are able to penetrate only through the lenticels. Bramley's Seedling and Oregon apple segments were supported in watch glasses, the lenticel inoculations being carried out by means of vaccine tubes sealed at the ground end to the selected lenticel. The fungi used included *Botrytis cinerea*, *Phomopsis coneglanensis*, *Sphaeropsis* sp., *Fusarium* [*lateritium* var.] *fructigenum*, *Alternaria* sp., *Polyopeus purpureus*, *Monilia* [*Sclerotinia*] *fructigena*, and a *Penicillium*. The results clearly demonstrated that all the fungi tested were able

to pass through lenticels. There was considerable variation in the time required by a given fungus to penetrate lenticels and cause decay.

Further studies (with Miss Carter) of resistance in relation to the chemical composition of apples with special reference to the interaction between fungal growth and varied acid, sugar, and nitrogen content [ibid., xii, p. 32] were made with fungi isolated from spots on Worcester Pearmain apples, including strains of *P. purpureus, Pleospora herbarum, F.* [*lateritium* var.] *fructigenum,* and *Alternaria* sp. It was found that changes in the concentration of sugar within the experimental limits had little effect on radial spread of the fungi, and little effect was observed when sucrose was substituted for glucose. Preliminary tests showed that the fungi varied in their response to changes in the nitrogen supply. When acid was present the same fungi varied more widely in their response, *Alternaria* falling in growth rate from zero to 0·04 per cent. nitrogen and then becoming nearly constant and *P. purpureus* rising sharply to 0·02 per cent. nitrogen and continuing to rise more slowly with increasing nitrogen. Data obtained with H. K. Archbold showed that in individual Bramley's Seedling apples the acid and nitrogen content ranged, respectively, from 0·670 to 1·374 and from 0·0142 to 0·0495 per cent.

Studies with S. N. Das Gupta of the significance of changes associated with age in the resistance of apples, in which Bramley's Seedling apples gathered early and late were inoculated with six saltant strains of *Cytosporina ludibunda* [ibid., xii, p. 782] and others gathered at the same time were inoculated periodically with three strains of the same fungus, showed that the nature of fungal response to increasing age of fruit varied with the fungal strain. When the data of radial advance recorded for 24 strains of species of *Cytosporina, Phomopsis,* and *Diaporthe* during 1927–9 were subjected to statistical analysis the results obtained [which are tabulated] showed that the strains fell into four classes as regards their power of attacking Bramley's Seedling apples. Thus, in the first class, radial advance in mm. per day for *P. coneglanensis,* three strains of *D. perniciosa,* and *P. mali* was, respectively, 0·1694, 0·1600, 0·1355, 0·0855, and 0·0976, while the corresponding figures for the lowest class were *C. ludibunda* strain CA_4 0·0180, *P. vexans* 0·0099, *P. pseudotsugae* 0·0034, and *C. ludibunda* strain CC_2 0·0023 mm.

A comparison of the data obtained during 1930 and 1931 showed quite clearly that East Malling stocks IV and VI in both years produced Bramley's Seedling apples more resistant to storage rots than stocks V and X [ibid., xii, p. 33].

Further tests were made of the effect of manuring on the resistance of apples [loc. cit.], all the samples being inoculated with *C. ludibunda* CE and stored at laboratory temperature. The results obtained indicated, as in the previous year, the existence of a relationship between resistance of the fruit and treatment of the trees with sulphate of ammonia, the value of mean radial advance, for instance, obtained for plots which received sulphate of ammonia in 1930, 1931, or in both years being 0·692 as against 0·364 calculated for plots not receiving nitrogen in any form.

BRIAN (P. W.). **Experimental study of moulds responsible for the wastage of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 66–68, 1 graph, 1933.

When spores of *Fusarium lateritium*, *Gloeosporium* sp., and *Trichothecium roseum* in water were exposed to the volatile products given off by apples, germination was considerably stimulated, the latent period being shortened, rate accelerated, and a stouter germ-tube produced. On the other hand, with *Penicillium expansum* the latent period was increased and germination rate retarded. Unlike those of the other moulds studied, the spores of *P. expansum* scarcely germinated at all in water, and did not appear to be wetted. Lack of nitrate or phosphate reduced germination by at least 70 per cent. in all the moulds studied, though all the spores were completely wetted; lack of sugar also reduced germination, but was associated with incomplete wetting.

KIDD (F.) & WEST (C.). **The control of superficial scald of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 58–62, 1 graph, 1933.

After stating that in the gas storage of English apples the conditions set up in the storage chamber are favourable to scald [*R.A.M.*, xii, p. 423] and intensify the inherent tendency to it shown by certain varieties, the authors describe a series of experiments conducted to compare the degrees of control given by wrappers containing different proportions of oil and made of two types of paper, one being an absorbent tissue with an air-dry weight of 1·42 gm. per 10 in. square sheet and the other a less absorbent tissue weighing 1·25 gm. per sheet. The apples, which were of the highly susceptible Newton Wonder variety, were gas-stored (some weeks after being gathered) at 3° C. in an average concentration of 3 to 4 per cent. carbon dioxide.

The results obtained [which are tabulated, graphed, and discussed] indicated that wrappers containing 20 per cent. oil would probably have given almost complete protection; the lighter paper, though containing slightly less oil, gave better control than the heavier.

CARNE (W. M.). **Low temperature breakdown in Tasmanian Apples.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 3, pp. 217–218, 1933.

Attention is drawn to the occurrence in Southern Tasmanian cool stores of a serious low temperature breakdown of apples (chiefly of the Scarlet, Sturmer, and French Crab varieties), previously reported from Great Britain [*R.A.M.*, viii, p. 252], the United States, and New Zealand [ibid., xii, p. 573], but not from Australia [ibid., x, p. 115]. Recent storage tests have shown that the incidence of breakdown in Cox's Orange Pippins ranges from double to 30 times as much after ten weeks' storage at 31° to 34° F. as at 38° to 40°. The disorder in this variety, Sturmer, and French Crab is of the 'soggy' type, whereas in Jonathan and Scarlet it is 'mealy' [ibid., vii, p. 790]. In 1932 the Scarlet variety also suffered from 'core flush' [ibid., xiii, p. 36].

ARNAUD (G.). **Essais de traitements des arbres fruitiers et de la Vigne.** [Experimental spray treatments of fruit trees and Vines.]—*Ann. des Épiphyties*, xviii, 6, pp. 357–367, 1 pl., 1932. [Received November, 1933.]

In tests conducted at Versailles in 1932, excellent control of pear scab (*Venturia pirina*), even on the highly susceptible Doyenné d'hiver variety, resulted from three applications, one pre-blossom and two post-blossom, of 2 per cent. Bordeaux mixture, similar control of apple scab (*V. inaequalis*) and vine mildew (*Plasmopara viticola*) being given by three applications at 1 per cent. and five at 2 per cent., respectively.

A colloidal copper product, 'bouillie B.C.C.', containing (undiluted) 12·5 per cent. copper, was about one-half to two-thirds as effective as the Bordeaux mixture.

FISH (S.) & GREATOREX (F. J.). **The control of summer spot of Pears.**—*Journ. Dept. Agric. Victoria*, xxxi, 9, pp. 438–442, 4 figs., 3 graphs, 1933.

The authors state that black or summer spot [scab: *Venturia pirina*: *R.A.M.*, xiii, p. 36] is one of the more serious factors that limit the export of pears from Victoria, where in 1932 it rendered some 25 per cent. of the fruit unfit for the trade. After a brief, popular outline of the life-history of the parasite, a few details are given of spraying experiments in 1932 at Doncaster, Victoria, on the pear varieties Packham's Triumph, William's Bon Chrétien, Beurré Bosc, and Winter Nelis which, together with Vicar of Winkfield, are the most susceptible to this disease. The results showed that the maximum of fruit suitable for export (nearly 90, 60, and over 80 per cent. in Packham's Triumph, Bon Chrétien, and Beurré Bosc, respectively) was obtained from trees that received two pre-blossom sprays (just as the young folded leaves were protruding, and when they were well separated from the unopened blossom bud) with 6-4-40 Bordeaux mixture, followed by an application of half-strength Bordeaux mixture when the fruit was set. Where, however, the fruit cover spray consisted of 1 in 80 lime-sulphur instead of Bordeaux mixture, the percentage of marketable fruit was reduced in the same varieties to 40, 20, and 45, respectively, chiefly owing to the development of this disease. The two pre-blossom sprays caused no visible injury on the four varieties tested, and only very slight russeting resulted from the half-strength Bordeaux mixture cover spray on the fruit.

ROSE (D. H.) & LUTZ (J. M.). **Injury to Pears caused by paper liners impregnated with sodium silicate.**—*Journ. Agric. Res.*, xlvii, 3, pp. 153–162, 3 figs., 1933.

A brown spotting which has been observed in recent years on russeted varieties of pears packed in wooden boxes, either immediately on their arrival at various United States markets or in cold storage lots, was experimentally shown to be caused by the alkaline sodium silicate adhesive used to join the paper lining inside the boxes. It was found that when the sodium silicate was neutralized with sulphuric acid, no discoloration of the pears ensued, and that the spotting was almost entirely removed from Winter

Nelis pears by standing the fruit for one hour in a 1 per cent. solution of hydrochloric acid. The direct cause of the injury appeared to be the alkaline substances contained in commercial sodium silicate. Paper linings joined with other adhesives did not discolour the pears.

FISH (S.). **Brown rot in Peaches. Goulburn valley fruit in Sydney.**—*Journ. Dept. Agric. Victoria*, xxxi, 8, pp. 381–383 and 387, 3 figs., 1933.

The author states that the chief obstacle to the development of a steady and profitable market in Sydney for the peaches grown in the Goulburn valley is the deterioration of the fruit during transit, due to mechanical injury to the fruit in packing with consequent development of brown rot [*Sclerotinia fructicola*: *R.A.M.*, xiii, p. 33]. In the last season the Goulburn fruit marketed in Sydney was sold at a loss to the growers of about £20,000, largely due to wastage from brown rot, which was exceptionally prevalent in the orchards. The conditions that favour infection of the fruit in the orchard are discussed and the measures which may minimize the incidence of the rot indicated, among which strict sanitation of the orchards, involving the removal from them of all infected material, avoidance of too mature fruit, rapid precooling, and the spraying of the trees with lime-sulphur or ammonium polysulphide, in addition to the usual spraying schedule with Bordeaux mixture, are considered to be the most likely to give good results. The ammonium polysulphide spray may be applied very near picking time without leaving a noticeable spray deposit on the fruits.

VAUGHAN (E. K.). **Transmission of the crinkle disease of Strawberry.**—*Phytopath.*, xxiii, 9, pp. 738–740, 1 fig., 1933.

During the winter of 1931–2 greenhouse tests were carried out at the Oregon Agricultural Experiment Station to determine the nature of the infective principle in strawberry crinkle [*R.A.M.*, xi, p. 792] and its mode of transmission.

Strawberry leaf aphids (*Myzus fragaefolii*) were transferred from diseased Marshall plants to a total of 50 healthy plants of the same variety, on which they were allowed to feed for a week. Of these 42 (84 per cent.) contracted the symptoms of crinkle which later disappeared, however, in 23. Non-viruliferous, adult female aphids were transferred, after several weeks' colonization and multiplication, from one lot of healthy Marshall plants to another with negative results. Five out of ten Marshall plants to which aphids were transferred after feeding for 14 days on the mildly affected Ettersburg No. 121 variety developed 'pin-point' chlorotic areas without any other symptoms. Attempts at the transmission of crinkle by grafting, leaf mutilation, or the use of diseased leaf extracts gave negative results.

OGILVIE (L.). **The control of hard rot of Strawberry fruits.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, p. 102, [1933].

Paxton strawberries severely infected with hard rot (*Septoria*

fragariae) [*R.A.M.*, xi, p. 726] were sprayed with Bordeaux mixture 5–7·5–50 in August, 1931 and the following May, another similar plot being treated with 5 per cent. tar oil emulsion on 22nd January, 1932. On 17th June, 1932, these plots showed, respectively, 1 and 7 per cent. fruit infection, as against 52 per cent. in the untreated control plot, the corresponding figures on 7th July being 25, 20, and 64 per cent. The tar oil treatment killed off the leaves in January, but these were succeeded by others which remained vigorous and healthy, and a good crop resulted.

VOGEL (F.). **Über die Bedeutung der Nährstoffe und des Kali-Stickstoffverhältnisses bei der Stachelbeere (Vorläufige Mitteilung).** [On the importance of nutrients and of the potash-nitrogen ratio to the Gooseberry. (Preliminary note).] *Ernähr. der Pflanze*, xxix, 18, pp. 339–346, 17 figs., 1933. [English summary on pp. 351–352.]

The results of pot experiments with Lady Delamare gooseberries at Weihenstephan, Bavaria, from 1929–32, indicated that leaf scorch is not primarily due to potash deficiency [*R.A.M.*, xii, p. 302], but rather to an unbalanced nitrogen : potash ratio leading to assimilatory disturbances.

NOBLE (R. J.). **Australia: success in control of bunchy top disease of Bananas in New South Wales.**—*Internat. Bull. of Plant Protect.*, vii, 9, p. 195, 1933.

In consequence of the rapid spread of bunchy top [see above, p. 78] the New South Wales banana industry declined from 650,000 bushels from 4,750 acres in 1922 to 91,144 bushels from 1,002 acres in 1925. However, thanks to the stringent quarantine and other control measures enforced by the Government in 1927 [see next abstract], the production figures have since gradually improved, reaching 515,140 bushels from an area of 4,733 acres for the year ending June, 1932.

EASTWOOD (H. W.). **Bunchy top control. Early identification, eradication of infective aphids, and destruction of diseased stools.**—*Agric. Gaz. New South Wales*, xliv, 8, pp. 611–614, 1 fig., 1933.

Full directions are given for the control of bunchy top of bananas in New South Wales [*R.A.M.*, viii, p. 585, and preceding abstract] by prompt detection of the symptoms; immediate and thorough spraying of diseased stools with power paraffin to destroy the aphid vectors [*Pentalonia nigronervosa*] of the virus; eradication of infected stools and their destruction by burning, preferably in the holes from which they are dug out. Additional precautions should include the application of a contact insecticide (e.g., 40 per cent. nicotine sulphate, or paraffin emulsion) to neighbouring stools; limitation of the number of plants and suckers per stool; wide spacing, clean cultivation, and other sanitary measures.

PARK (M.). **The oil treatment of Plantain diseases.**—*Trop. Agriculturist*, lxxxi, 2, pp. 86-90, 1933.

A brief account is given of experiments in Ceylon, the results of

which showed that a light gas oil of specific gravity 0·864 and closed flashpoint 170/180° F., locally procurable from the Shell Company under the name Plantain Disease Oil at a comparatively low cost, was effective in killing in situ the roots of plantains affected with bunchy top [see preceding abstracts] or with Panama disease (*Fusarium* [*oxysporum*] *cubense*) [cf. *R.A.M.*, xi, p. 585]. The doses recommended are 1 pint for small and 2 pints for moderately large clumps (2½ to 3 years old), the cost of the oil used in the treatment averaging ten cents [1·8*d.*] per plantain stool.

SURRIDGE (H. R.). **Annual report by the Agricultural Officer, 1932.**—*Dept. of Agric., Fiji, Ann. Bull. Divis. Repts. 1932*, pp. 1–22, 2 pl., 1933.

The following item of phytopathological interest occurs in this report. Heavy damage was again caused in the banana plantations, especially of Vitilevu, by the so-called 'Sigatoka' or leaf spot disease (*Cercospora musae*) [*R.A.M.*, ix, p. 739; x, p. 480], which caused a loss of some 60 per cent. of the total crop. At the Experiment Station the loss amounted to 100 per cent. It has yet to be determined whether the discoloration of the flesh of fruit at nearly all stages of growth associated with this disease is actually caused by it. Infection was checked to some extent by spraying in April, May, and June with half or full strength Burgundy mixture, combined with 2 per cent. raw or boiled linseed oil or with 2 or 3½ per cent. coco-nut oil.

TOMKINS (R. G.). **The prevention of mould on stored fruit by the use of gases and volatile substances.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 65–66, 1933.

When English glasshouse tomatoes were stored at 12° C. and air currents containing, respectively, 12·5, 6, 3, and 1·5 c.c. of ammonia per 10,000 c.c. of air were passed over them, all the samples were sound after 26 days, though when similar samples were stored in air *Botrytis cinerea* appeared on the calyx after seven days, 50 per cent. of the fruits were attacked after 20 days, and they were all rotted after 26 days.

When wounded oranges inoculated with *Penicillium digitatum* were stored at 18° in air passed over 10 per cent. solutions of alcohol, green mould was not reduced; when the air was passed over 20 per cent. solutions of alcohol infection was considerably reduced, but the appearance and flavour of the fruit were impaired. Storage in air passed over 15 per cent. solutions of alcohol appreciably reduced the mould without seriously affecting the flavour [*R.A.M.*, xii, p. 34].

LINDBLOM (A.). **Sprutor och bepudringsapparater för bekämpning av parasiter å trädgårdsväxter. De vanligaste kemiska medlen i växtparasitbekämpningens tjänst.** [Sprayers and dusting apparatus for the control of orchard parasites. The best-known chemical preparations for the control of plant parasites.]—*Statens Växtskyddsanst. Flygbl.* 3 & 4, 17 pp., 15 figs., 1 diag., 1933.

The first of these two leaflets gives notes on the construction,

method of working, cost, and other particulars of the various types of spraying and dusting apparatus used in Swedish orchards, while the second deals with the composition and application of some standard fungicides and insecticides (exclusive of those employed in the treatment of seed-grain).

DESRUE (A.) & CHASSET (L.). **Sur la préparation de la bouillie bordelaise.** [On the preparation of Bordeaux mixture.]—*Rev. de Vitic.*, lxxix, 2041, pp. 154–156, 1933.

The authors state that, as indicated by their experience, the mode of preparation of Bordeaux mixture [*R.A.M.*, xiii, p. 44] is of little importance where it is applied from sprayers working and refilled under high pressure, since in every case the mixture is thoroughly stirred up and kept in durable suspension in the process of refilling, this preventing the formation of a coarse deposit in the period of time necessary for the application of the quantity of spray contained in the sprayer. The same also applies to cupric sprays emulsified with a mineral oil.

VERMOREL. **Les hautes pressions en pulvérisation.**—[High pressures in pulverization.]—*Rev. de Vitic.*, lxxix, 2042, pp. 117–123, 7 figs., 1933.

The author points out that the pressure to be applied inside spraying apparatus must be carefully adjusted in accordance with many interconnected factors, chief among which are the nature, height, and density of the plants treated, their stage of seasonal growth, length of the spray-distributing hoses, and the like, the same applying, though to a lesser degree, to dusters using sulphur and other fungicidal or insecticidal powders. The paper also includes brief descriptions of several spraying and dusting apparatus (chiefly of his own construction) adapted for the treatment of different crops, and to the requirements of small land-holders or of large estates.

PALLIER (A.). **La résine colloïdale comme mouillant et fixatif.** [Colloidal resin as a wetting agent and adhesive.]—*Rev. de Vitic.*, lxxix, 2040, pp. 92–94, 1933.

In this brief note the author states that a colloidal emulsion of colophony has been recently produced in France, which in preliminary tests on the vine gave indications of considerably increasing the wetting capacity and adhesiveness of cupric sprays when added to the latter at the rate of 1 per cent. The emulsion does not coagulate in the spray, and in a small experiment vines sprayed with Bordeaux mixture containing it withstood well the action of very heavy rains, while control vines sprayed with the usual mixture were practically washed clean. The preparation is being further tested for spraying trees and kitchen-garden vegetables.

SORAUER (P.). **Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären und Virus-Krankheiten. Erster Teil. Sechste, neubearbeite Auflage.** [Handbook of

plant diseases. Volume I. The non-parasitic and virus diseases. Part I. Sixth revised edition.]—x + 592 pp., 107 figs., 1 diag., 6 graphs, 9 maps, Berlin, P. Parey, 1933.

This section of the sixth revised edition of Sorauer's 'Handbook of plant diseases', in the preparation of which Dr. O. Appel is assisted by Drs. Braun, Hiltner, Köhler, Merkenschlager, Morstatt, K. O. Müller, Pfeil, Schlumberger, Tiegs, and Wartenberg [cf. *R.A.M.*, xi, p. 527], is the first part of the first volume, which will include the non-parasitic and virus diseases.

The first (general) part of the work comprises a survey by Braun of the history of plant diseases and pests from the earliest times to 1880, and a general account by Morstatt of the science of phytopathology, treated under the aspects of the nature, symptoms, and causation of disease and the environmental factors involved in its development. In the second (special) part, Merkenschlager deals with plant nutrition and disease, including such metabolic disorders as heart and dry rot of beet [ibid., xii, p. 2], manganese deficiency of oats [ibid., xi, p. 363 *et passim*], and reclamation disease of cereals [ibid., xii, p. 86]; E. Hiltner with the causation of disease by climatic and meteorological factors, e.g., the die-back of firs [ibid., xii, p. 480], intumescences, and the like; and Wartenberg with the pathological effects of heat and cold, the latter associated, for instance, with the so-called 'Rhenish die-back' (apoplexy or gummosis) of cherry trees [ibid., xii, p. 575].

This section of Sorauer's well-known volume on the non-parasitic diseases has been entirely recast and brought up to date, and the special part contains much the most complete survey of the nutritional and climatic factors that injure plants hitherto available.

[Wallace (G. B.).] **Tanganyika Territory Department of Agriculture. Mycological leaflets 1, 2, 3, 4, 5, 6 (revised), 7, 9, 10, 12 [mimeographed], 13 (revised), 14.**—32 pp., 1930–33.

This is a series of popular leaflets on the more important plant diseases of Tanganyika, viz., coffee rust (*Hemileia vastatrix*), brown blight of coffee leaves (*Colletotrichum coffeanum*), brown eye spot of coffee (*Cercospora coffeicola*), damping-off of seedlings (*Rhizoctonia* sp.), die-back of coffee (mainly due to exhaustion), root diseases of coffee and other plants (*Armillaria* sp., *R. bataticola* [*Macrophomina phaseoli* and *R. lamellifera*], *Sclerotium rolfsii*, and *Bacterium tumefaciens*, the last named found on roses only, up to the present), 'cherry fall' of coffee (probably analogous with the 'black bean' disease in India) [*R.A.M.*, vi, p. 465], coffee bean disease (*Nematospora coryli*) [ibid., xi, p. 572], coffee bark disease (*Fusarium lateritium* var. *longum*) [ibid., xi, p. 711], coffee berry disease (*Colletotrichum coffeanum*), not yet known to occur in Tanganyika but prevalent in Kenya, and cereal diseases (the Kiswahili version of *Mycol. Circ.* 2, 4 pp. [mimeographed]). Leaflet 10 deals with the preparation of Bordeaux mixture and other fungicides.

STEVENS (N. E.). **United States of America: disappearance of Zostera marina along the Atlantic Coast of North America.** —*Internat. Bull. of Plant. Protect.*, vii, 9, pp. 195–196, 1933.

The widespread disappearance of the grass-wrack or eel grass seaweed (*Zostera marina*) from the Atlantic coasts of the United States, France, and Holland has already been reported [*R.A.M.*, xiii, p. 46], and field observations made chiefly by members of the Biological Survey of the United States and the Biological Board of Canada indicate that extensive areas between Beaufort, North Carolina, and Nova Scotia were practically denuded during the summer of 1932. Considerable importance attaches to the loss of this staple winter food of various game birds. Throughout the affected coastal stretches are estuaries and river mouths (e.g., Upper Chesapeake Bay), in which the sea water is strongly diluted by fresh water, where *Z. marina* is still persisting in an apparently normal condition. Some of the areas which showed a vigorous new growth of seedlings in the early spring of 1933 were again almost denuded by June.

No evidence of parasitism has hitherto been obtained, as amongst the various organisms isolated from the affected plants none has been found to predominate.

DUNCAN (F. M.) & COTTON (A. D.). **Disappearance of Zostera marina.**—*Nature*, cxxxii, 3334, p. 483, 1933.

In the light of his extensive inshore collecting experiences with marine invertebrate fauna during the last ten years, the first author suggests that, at any rate as regards the English Channel, the widespread contamination of the water by the crude oil waste from ships and motor-boats may be a factor in the disappearance of the grass-wrack seaweed, *Zostera marina* [see preceding abstract]. Replying to this suggestion, A. D. Cotton regards the theory of oil pollution as untenable on the grounds of (1) the sudden dying-out of the seaweed over such a very wide area; (2) its general disappearance over the area in question irrespective of the degree of oil pollution; and (3) the continued existence of *Zostera* beds for many years in areas believed to be heavily polluted. In Europe, as in the United States, *Z. nana* is still abundant and apparently uninjured.

RYJKOFF (V. L.). Мутации и болезни хлорофиллого зерна. [Mutations and diseases of the chloroplast.]—192 pp., 74 figs., State Publishing Office 'Selkhozgiz', Moscow, 1933.

This book, a publication of the Ukrainian Institute for Plant Protection, is stated by the author in a brief introduction to be the first attempt in the Russian language to give a summary review of the results obtained up to date both in Russia and abroad in the study of the plant diseases and conditions involving a pathological or genetical modification of the chloroplast and leading to the partial or total loss of chlorophyll. In this account some of the author's own investigations are included, and an outline is given of the direction in which he believes further work should be prosecuted.

The book is divided into nine chapters, the first of which deals

very briefly with the normal structure and development of the plastids. In the second there is a comprehensive discussion of infectious chlorosis, mosaic, and related virus diseases, planned much on the same lines as those followed by K. M. Smith in his recent publication [*R.A.M.*, xii, p. 647]. In a brief summary of this chapter the author considers that the balance of evidence suggests that the various infectious agencies known as viruses partake more of the nature of inanimate substances, more or less related to catalysts or enzymes, than of that of living organisms. The third, fourth, fifth, and sixth chapters deal with the macroscopical and microscopical symptoms of non-infectious variegation (including total albinism) of various plants, and with the genetics of the inheritance of this condition. The seventh chapter discusses the pathological changes brought about in the plastids by physical and chemical factors, and also those caused by the action of parasitic organisms and the viruses. The eighth chapter deals with the physiological aspect of the pathological conditions of the chloroplasts, and the ninth with the bearing of environmental factors on the development of chlorophyll. The bibliography appended comprises over 425 titles.

SMITH (J. H.). **Some aspects of virus disease in plants.**—*Empire Journ. Exper. Agric.*, i, 3, pp. 206–214, 1933.

Starting from the assumption that virus diseases of plants are steadily acquiring a wider distribution and greater intensity as compared with a generation ago, the writer concisely outlines some of the main problems awaiting solution in this field, with illustrations from contemporary researches. Foremost among the questions to be decided are the relationships between virus and insect vector and virus and host; the adoption of a system of classification; and the nature of the viruses, on which point the writer inclines to the 'living entity' view [cf. *R.A.M.*, xii, p. 308 and preceding abstract].

CHESTER (K. S.). **The problem of acquired physiological immunity in plants.**—*Quart. Rev. of Biol.*, viii, 2, pp. 129–154; 3, pp. 275–324, 1933.

The present paper is a critical analysis of the problem of acquired physiological immunity in plants [*R.A.M.*, xii, p. 779], the understanding of which is simplified by an opening section on immunological conceptions and terminology. None of the objections commonly raised to the possibility of the existence of acquired immunity in plants, i.e., differences between the circulatory system of the latter and that of animals, manner of growth, opportunity for sensitization, and reaction towards disease, has been found to be valid. It is considered to have been demonstrated by several lines of investigations that a form of immunity analogous with that acquired by animals may be developed in plants as a result of parasitism, the resistance to which on the part of plant hosts is, moreover, more satisfactorily interpreted on the basis of this theory than by any other explanation yet advanced. There is also considered to be strong evidence for a general occurrence of acquired immunity in symbioses throughout the entire plant kingdom.

An experimental analysis of the nature of acquired physiological immunity in plants indicates that the phenomenon is wholly or entirely manifested in the reactions of living cells.

The possibility of the practical application of the principles of acquired immunity is discussed, and a number of suggestions are made as to the direction of future studies in this field. The paper terminates with a bibliography of over 200 titles.

LINK (G. K. K.) & WILCOX (HAZEL W.). **Precipitin-ring test applied to fungi. II.**—*Bot. Gaz.*, xcv, 1, pp. 1–34, 1933.

A fully detailed and tabulated account is given of the writers' further studies on the applicability of the precipitin-ring test in the differentiation of certain groups of Fungi Imperfecti [*R.A.M.*, xi, p. 798].

Potent antisera and test antigens (giving maximum titres of 1 : 25,600) were prepared from 34 species and strains by using fractions of the powdered fungal mats soluble in 0·85 per cent. sodium chloride solution. Generally speaking, the cross precipitin reactions were too strong to permit of identification by this method, but in a limited number of tests members of the Pezizales (*Sclerotinia fructicola* and *S. sclerotiorum*) were differentiated from those of the Hypocreales (*Neurospora tetrasperma*, *Fusarium* spp., *Cylindrocarpon album*, and *Ramularia* sp.), some of which were in turn mutually distinguishable by their serological reaction. *S. fructicola* and *S. sclerotiorum*, and the plus and minus strains of *N. tetrasperma*, were differentiated by the precipitin absorption test. Many attempts to demonstrate specific precipitabilities for the saline extracts of *Fusarium* spp. gave negative results. In its present form, therefore, the precipitin-ring technique is scarcely adapted to the differentiation of all the forms separable by morphological and physiological (e.g., host and symptom specificity) criteria. However, a consideration of all the reactions of each of the organisms tested points to a distinct serological individuality in every case.

RANDS (R. D.) & DOPP (E.). **Humus extract agar favorable for oospore production in Pythium.**—*Phytopath.*, xxiii, 9, p. 745, 1933.

The addition of humus extract (so-called humic acid) from woodland and garden soils or from decomposed filter-press cake at the rate of 50 p.p.m. (organic content) to a medium of maize meal agar and grated carrot resulted in satisfactory oospore production by the agent of root rot of sugar-cane, *Pythium arrhenomanes* [*R.A.M.*, xi, p. 28], which ordinarily fails to develop this stage in culture. The extract was prepared according to the method described by Burt, Lineweaver, & Horner (*Soil Sci.*, xxxiii, pp. 413–453, 1932). Synthetic humic acids did not stimulate oospore production.

TOMKINS (R. G.). **The action of certain volatile substances and gases on the growth of mould fungi.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 62–65, 1 graph, 1933.

After pointing out that certain volatile compounds and gases

such as hydrogen cyanide and hydrogen sulphide, which attack the respiratory mechanism of moulds, are quite distinct in their action from substances such as chloroform which inhibit cell division before respiration is seriously reduced [*R.A.M.*, xii, p. 46], the author described an experiment (made to ascertain directly whether inhibitors primarily attacking the respiratory centres retard growth in a particular way) in which *Rhizopus nigricans* was grown in low concentrations of oxygen (0·2 to 3 per cent.) and in carbon monoxide.

The results [which are tabulated, graphed, and discussed] showed that a concentration of 3 per cent. oxygen delayed the appearance of the colony and that still greater reduction increased this delay. Growth rate was also reduced, especially at first; after a period of slower initial growth a phase of constant growth set in.

The presence of carbon monoxide delayed the appearance of the colony and reduced the growth rate. The reduction in growth did not depend on the absolute concentration of the carbon monoxide, but was also determined by the amount of oxygen present. Mixtures of oxygen, carbon monoxide, and nitrogen in which the ratio of carbon monoxide to oxygen was the same tended to have approximately the same effect on growth. When the oxygen concentration was low the effect of a given mixture of carbon monoxide and oxygen was greater than it was at higher concentrations of oxygen. At high carbon monoxide to oxygen ratios the density of the mycelium was much reduced.

The manner in which decrease in tension of oxygen retards growth in many respects resembles that in which growth is retarded by hydrogen cyanide, hydrogen sulphide, and acetaldehyde [loc. cit.]. It is not, however, certain, that the retarding action of such substances is exactly equivalent to a reduction in the tension of oxygen. No simple classification of inhibitors by their action on the growth of moulds appears to be possible.

Development of seed Potato production in the Irish Free State, 1922–1932.—*Journ. Dept. Agric. Ireland*, xxxii, 1, pp. 81–84, 1933.

Since 1925 potato crops in the Irish Free State have been inspected for freedom from leaf roll and mosaic as well as blackleg [*Bacillus phytophthorus*], and in the same year arrangements were made by the Department of Agriculture to have the produce of certified crops packed in bags, examined, and sealed before dispatch. The following were among the conditions of certification laid down for growing crops in 1932, when 3,764 acres were certified. The crop must be absolutely free from leaf roll and contain no plants affected by mosaic in such a degree as to reduce their yielding capacity. All plants infected by blackleg must be dug out before certification. 'Rogues' must be dug out, not pulled, no certificates being granted in cases where the tubers are left in the ground. Special 'health' certificates will be issued only for crops grown not less than 50 yds. from other potatoes and showing complete freedom from both mosaic and leaf roll.

KÖHLER (E.). **Ein latentes Kartoffelvirus.** [A latent Potato virus.]—*Naturwissensch.*, xxi, 31, p. 578, 1933.

An externally healthy Erdgold potato plant at Berlin-Dahlem was found to contain a virus, which is termed E8, which was transmissible by rubbing to tobacco, again producing no apparent symptoms in this host. Other symptomless Erdgold plants tested did not contain the virus. The E8 virus may be readily detected in a tobacco plant with latent infection by rubbing the leaves with a mosaic virus of the X group [*R.A.M.*, xii, p. 648] which induces characteristic symptoms of a mixed infection. The vegetative progeny of latent-infected Erdgold plants subsequently inoculated with the virus H19 [ibid., xii, p. 586] showed marked symptoms of leaf curl, but when H19 alone was used to inoculate healthy Erdgold plants it remained latent without producing symptoms. The question whether E8 is a greatly attenuated Y virus is under investigation.

EYER (J. R.) & CRAWFORD (R. F.). **Observations on the feeding habits of the Potato psyllid (Paratrioza cockerelli Sulc.) and the pathological history of the 'psyllid yellows' which it produces.**—*Journ. Econ. Entom.*, xxvi, 4, pp. 846–850, 3 pl., 1933.

After a brief description of the symptoms of psyllid yellows of potatoes [*R.A.M.*, xii, p. 461], the writers give a preliminary account of their studies in New Mexico on the mode of feeding of the insect vector (*Paratrioza cockerelli*) and its effects on the plants.

The potato psyllid is primarily a leaf feeder, but a few individuals have been detected on the stems and petioles. The beak may pass between the cells or enter them, feeding being chiefly in the phloem parenchyma cells bordering the xylem in the larger veinlets, or in the companion cells and modified parenchyma forming the major portion of the vascular bundles in the smaller veinlets. The cells entered often collapse and the resultant cavities become filled with granular materials. Sections of diseased stems and petioles show abnormally large deposits of starch granules in the cortex.

It would appear that the feeding of *P. cockerelli* is not calculated to induce wholesale destruction or mechanical plugging of the vascular system. Translocation is immediately disturbed, however, by the phloem alterations, and these primary disturbances could readily become accentuated if there were an injection of some infectious principle or toxic enzyme.

SCHMIDT [E.]. **Die Züchtung Phytophthora-widerstandsfähiger Kartoffeln.** [The breeding of *Phytophthora*-resistant Potatoes.]—*Deutsche Landw. Presse*, lx, 38, pp. 485–486, 5 figs., 1933.

In connexion with the investigations already described on the breeding of potatoes for resistance to *Phytophthora* [*infestans*] in Germany [*R.A.M.*, xiii, p. 53], the writer reports an experiment in which weekly applications of Bordeaux mixture were given from early July to certain plots of Erstling [Duke of York] and some of the resistant early hybrids between *Solanum demissum* and

cultivated varieties, which had maintained their resistance even to the form of blight which has recently devastated the Ef. strains [loc. cit.], while others were left untreated for comparison. In both the sprayed and unsprayed plots the foliage of the resistant strains died off uniformly in the latter part of August, showing that blight was not a factor in the withering of the green parts, whereas the treated Duke of York plants remained green about three weeks longer than the untreated. For practical purposes, however, protraction of the normal vegetative period in early varieties is undesirable as it delays ripening and lessens the value of the early crop. Partial rather than complete resistance should, therefore, be the aim of selection in the case of early varieties. This would mean a sufficient retardation in the development of the fungus to preclude the sudden destruction of an entire crop in two to three days as commonly happens at present. With medium-early and medium-late varieties, however, the highest possible degree of resistance should be the standard of breeding requirements. In view of the failure of the Ef. strains, the existence at Streckenthin of this collection of *S. demissum* hybrids, in which early, medium, and late varieties are represented and blight-resistant strains in each group are available, affords an opportunity to carry on the work of breeding for resistance combined with commercial qualities, considerable progress in which has already been made.

CROSIER (W.). **Culture of Phytophthora infestans.**—*Phytopath.*, xxiii, 9, pp. 713–720, 1 graph, 1933.

For ordinary purposes the best method of growing *Phytophthora infestans* in pure culture is on raw aseptic tuber plugs [*R.A.M.*, i, p. 253]. For abundant sporangial production the best results were obtained on slices of surface-sterilized potato tubers or on the foliage of plants, kept at a temperature of 18° to 20° C. if rapid sporangial formation is required or at 10° if the fungus is to be maintained for some time. After the lesions form the leaves are detached and incubated in a moist chamber whenever a crop of sporangia is required. The establishment of the fungus in the tuber slices proceeds at a range of 9° to 24°, with an optimum at 19° to 22°. The development of aerial mycelium may be expected within 2½ to 3 days at the optimum temperature and 100 per cent. humidity, but a slight decrease in the humidity retards it and a fall to below 90 per cent. prevents the process altogether. In tuber slices kept at 6° the amount of bacterial contamination was negligible; aerial mycelium seldom developed before 15 days, followed 5 days later by sporangia. The corresponding times for mycelial formation at 9°, 12°, and 15° were 12 to 14, 6 to 7, and 4 to 6 days, respectively.

A batch of Rural Russet tubers, artificially inoculated with *P. infestans*, was kept from October, 1931, to July, 1932, at a temperature of 4° to 6° and a relative humidity of 80 to 85 per cent. At the end of the period very little bacterial rot was apparent, though some of the tubers were nearly destroyed by the fungus. On placing the tubers in a saturated atmosphere at 18° abundant sporulation rapidly took place. The conditions employed in this test simulate those of ordinary winter storage.

The sporangia were found to germinate most profusely at 12° to 13° by zoospores (indirect germination) and at 24° by germ-tubes (direct germination). The range of indirect germination extends from 1° or below to 25° and that of direct germination from 6° to nearly 30°. In controlled humidity tests at 20°, 72 per cent. indirect germination was obtained when the sporangia were sown in water after an hour at 99 per cent. relative humidity, as against 45 per cent. at 90, 11 at 50, and 5 at 25. The sporangia of *P. infestans* germinate only in the presence of water, the addition to which of vaseline, bentonite [ibid., xi, p. 788], or infusorial earth stimulates the process. The zoospores may be maintained in a motile condition by holding the spore suspension at 3°. The zoospores germinate most abundantly at 15° and rapidly die at 26° or above. In inoculation work the foliage of the plants should be kept moist for at least 1½ hours at 20° to 25° (the optimum for penetration), 2 hours at 15°, and 2½ to 3 hours at 10°. The results of numerous experiments tend to prove that *P. infestans* spreads most rapidly in the field when the temperature favours indirect sporangial germination (12° to 13°).

MURPHY (P. A.) & MCKAY (R.). **Tests of certain dusts and ready-made sprays for the control of Potato blight in comparison with Burgundy mixture.**—*Journ. Dept. Agric. Ireland*, xxxii, 1, pp. 30–48, 4 pl. (2 facing pp. 4–5), 1933.

In a series of trials [which are fully described and tabulated] from 1927 to 1930 at the Albert Agricultural College, Glasnevin, Dublin, on the relative merits of 2 per cent. Burgundy mixture and various dusts in the control of potato blight [*Phytophthora infestans*] on the Up-to-Date, British Queen, Golden Wonder, and Arran Victory varieties, the former proved more generally reliable and profitable, especially in seasons of severe infection. In years of milder attack the Niagara copper-lime dusts 6 and 25 (containing 19 and 24 per cent. monohydrated copper sulphate, respectively) sometimes produced a heavier and more lucrative crop when used in large quantities (100 lb. per acre) but not at the rate of 35 to 40 lb. per acre. The more concentrated 25 dust did not prove superior to 6. In the last year of the tests an English 20 per cent. copper hydrate powder, the active ingredient of which was the dried and ground precipitate of Bordeaux mixture, containing 20 per cent. copper, gave promising results at the rate of 15 to 20 lb. per acre. In 1931 and 1932 the liquid copper spray known as bouisol [see above, pp. 98, 104] was also included in the experiments. At the lower concentrations this preparation gave inadequate protection, and only at a strength of 10 lb. in 100 galls. were results obtained that approached, but still did not equal, those secured with Burgundy mixture. The principal weakness of bouisol appears to lie rather in its poor adhesive capacity and failure to persist on the leaves until the critical period in August than in any lack of fungicidal efficacy. Excellent results were obtained when two applications of bouisol were followed by a final treatment with Burgundy mixture, which possesses the combined advantages of permanency and of retarding undesirable growth in the later stages of vegetation.

Estimating the average loss from blight at 3½ tons per acre, valued at £12 5*s*., the cost of spraying must be kept within £12 per acre to secure a reasonable profit. The large increases of yield obtained in some of the writers' experiments are attributed chiefly to the liberal use of materials. A vigorous crop cannot be protected with less than 160 galls. of spray per acre and as much as 240 galls. may be necessary. The extra profits derived from plentiful applications were out of all proportion to the increased cost. Thus, an additional 5 cwt. of potatoes suffices to compensate for the difference in cost of materials between three heavy dressings with 2 per cent. Burgundy mixture (34*s*. per acre) and three at 1 per cent. (17*s*.), whereas an increase of over 1½ tons may usually be anticipated and in years of severe blight and high prices proportionately more both in quantity and value.

AUSTIN (M. D.) & MARTIN (H.). **The incorporation of contact insecticides with protective fungicides. Potato field trials, 1930-1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, pp. 49–58, 1933.

Vegetable oils having proved effective fungicides against *Sphaerotheca humuli* on the hop, tests were made of combined vegetable oil and pyrethrum sprays at the South Eastern Agricultural College, Wye, Kent, in 1930, for the control of potato blight [*Phytophthora infestans*] and certain insects. These failed to control the blight.

A year later, copper-containing sprays suitable for heavy applications [see above, p. 105] were combined with the vegetable oils and a contact insecticide, the treatments given being Bordeaux mixture (10 : 15 : 100), the same with 0·75 per cent. concentrated sulphite lye (60° Tw.) and 0·02 per cent. nicotine, 1 per cent. cottonseed oil solution of pyrethrum extract emulsified with Bordeaux mixture (10 : 15 : 100), copper oleate 0·2 per cent. in solution in cottonseed oil emulsified at 2 per cent. by the two-solution oleic acid method [*R.A.M.*, xii, p. 576], and salicylanilide (Shirlan paste) [ibid., xiii, p. 10] at 1 per cent. in suspension in 0·25 per cent. agral I.

Only the Bordeaux mixture and its modifications gave effective blight control and they had no injurious effect on the leaves. The average yield of healthy tubers per row treated with Bordeaux mixture, Bordeaux-sulphite lye, cottonseed oil Bordeaux, and untreated was, respectively, 45, 46, 49·5, and 34·5 lb.

In 1932, in similar trials with the seed saved from the previous ones the average yields of healthy tubers per two rows were, respectively, 46·2, 50·3, 50·1, 47·5, and 48·3 lb. for the following treatments: no application, Bordeaux mixture (10 : 15 : 100), the same with 0·75 per cent. sulphite lye (60° Tw.) and 0·02 per cent. nicotine, half-strength Bordeaux mixture (5 : 7·5 : 100) used to emulsify cottonseed oil at the rate of 0·75 per cent. by volume, with 0·02 per cent. nicotine, and full-strength Bordeaux mixture used to emulsify a cottonseed oil solution of pyrethrum extract, the spray containing 0·75 per cent. cottonseed oil and 0·002 per cent. pyrethrins.

The failure to obtain from the treatments significant differences in the yield of healthy tubers suggests that yield may not be a

suitable criterion of fungicidal efficiency; in both years observations of the amount of disease in the haulms gave better indications of the comparative merits of the fungicides, while significant results were obtained when the seed from the plots was grown on, those sprayed with an insecticide-fungicide combination giving 4·3 lb. per two rows more in the second year than the unsprayed, presumably due to control of infestation with insects, including the vectors of virus diseases.

LINDFORS (T.). **Åtgärder för bekämpande av bladmögel och brunröta hos Potatis.** [Control measures against leaf mould and brown rot of Potatoes.]—*Statens Växtskyddsanst. Flygbl.* 6, 6 pp., 2 figs., 1933.

Directions are given in popular terms for the control of 'leaf mould' and 'brown rot' [blight: *Phytophthora infestans*] of potatoes in Sweden by the use of healthy seed, the cultivation of resistant varieties [*R.A.M.*, viii, p. 735], spraying with Bordeaux or Burgundy mixture, and the provision of suitable storage conditions.

SEIFERT (E.). **Weisshosigkeit (Rhizoctonia) bei Kartoffeln.** ['White leg' (*Rhizoctonia*) in Potatoes.]—*Deutsche Landw. Presse*, lx, 38, p. 486, 1933.

It is stated that the incidence of infection by *Rhizoctonia* [*Corticium*] *solani* on potatoes in Germany is much more frequent than might be expected from the practical absence of external symptoms. Occasionally the disease may be recognized by the formation of small tubers by seed potatoes either in storage or in the field before the mother plant produces leaves. Under such unfavourable conditions for the seedlings as prevailed in the spring of 1933, the 'eyes' begin to decay in the soil before reaching the surface. Knowledge regarding the control of this disease is urgently required.

HEMMI (T.) & WATANABE (T.). **Studies on the stem rot (split stem) of Sweet Potatoes.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 314–327, 1 pl., 1933. [Japanese, with English summary.]

The conidial characters of four strains of *Fusarium* isolated by the writers from rotted sweet potato stems in Japan are stated to resemble those of *F. batatatis* and *F. hyperoxysporum* [*R.A.M.*, xi, p. 535] and to differ from *Hypomyces* (*Nectria*) *ipomoeae* [ibid., ix, p. 736], to which the disease is commonly attributed. Inoculations with three of these strains showed that they are capable of splitting the stem and causing a localized brown discoloration when inoculated through wounds, but they did not spread extensively. In soil infection through wounds, the mycelium apparently spreads somewhat more freely in plants grown on dry soil than under humid conditions. The optimum temperature for infection in greenhouse tests was found to be 32° C., at which the incubation period was only 6 hours compared with 18 at 24° and 40° and 12 at 28° and 36°. Two of the strains under observation were able

to grow at a hydrogen-ion range of P_H 3·6 to 8·6 on potato decoction agar with 2 per cent. sucrose.

HEMMI (T.) & ENDO (S.). **Studies on Sclerotium diseases of the Rice plant. VI. On the relation of temperature and period of continuous wetting to the infection of the Rice plant by Hypochnus sasakii Shirai.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 202–218, 1933. [Japanese, with English summary.]

The minimal periods of continuous wetting necessary for the infection of rice under experimental conditions by *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xii, p. 331] were found to be about 18 hours at 32° C. and 24 at 28°. At 36° and 24° infection seems to be barely possible. In a series of inoculation experiments on full-grown plants in pots, the most severe infection occurred at 32°; at 28° the virulence of the disease was slightly, and at 24° greatly reduced, while at 36° no trace of infection was apparent. No conspicuous differences could be detected between the Japanese strain of *C. sasakii* and a Philippine collection of the same fungus referred by M. A. Palo to the *Rhizoctonia* [*C.*] *solani* group [ibid., vi, p. 253].

SHARPLES (A.). **Annual Report of the Pathological Division.**—*Ann. Rept. Rubber Res. Inst. Malaya, 1932*, pp. 94–102, 1933.

Further studies of the parasitism of *Fomes lignosus* on *Hevea* rubber trees in Malaya [*R.A.M.*, xii, pp. 52, 54] showed that the fungus does not enter through wounds, but directly penetrates the living, healthy bark. The distribution of the disease in a new clearing is governed by that in the previous stand at the moment of felling, and the method previously described [loc. cit.] of ascertaining this by using the trees as indicators proved highly successful in large-scale tests. The rhizomorphs travel only along hard surfaces; they expend some of the food reserves of the mycelial mass in covering the surface of each obstacle they encounter, so that the effective range of each centre of infection varies inversely with the concentration of obstacles in the soil. Infection tends to increase with partial clearing of the rotting timber in the soil, but a limit of increase is attained when further removal checks continuous expansion. Propagation by spore infection appears to be unimportant.

A very close parallel exists between the modes of origin, propagation, and attack of *F. lignosus* and *Ganoderma pseudoferreum* in rubber plantations. *G. pseudoferreum* spreads by means of rhizomorphs, from the under side of which the penetration of living tissues takes place through healthy bark. The rhizomorphs are creamy-white, the surface later hardening into a characteristic dark red skin, which becomes a bright wine-red colour when moist. The disease is generally distributed equally with *F. lignosus* in stands of all ages. Whereas, however, the numerical losses due to *F. lignosus* are high in young stands and low in mature ones, the reverse holds for *G. pseudoferreum*, the rhizomorphs and mycelium of which grow and produce tissue decay more slowly than those of *F. lignosus* and remain active long enough to enable

the fungus to attack the stand at a period when every facility is provided for rapid spread by root contact. The discovery that *G. pseudoferreum* kills seedling *Hevea* rubber enables the centres of infection to be traced and eliminated before they can cause any visible damage, and while treatment for *F. lignosus* is also in progress.

In 1932, the west coastal districts of Malacca, Negri Sembilan, and Perak sustained a heavy attack of *Oidium heveae* [ibid., xii, p. 323], though the rest of Malaya remained practically unaffected.

The practice of allowing belukar [secondary jungle or forest undergrowth] to grow up as cover on rubber estates entails great danger of increased virulence on the part of mouldy rot [*Ceratostomella fimbriata*: ibid., xi, p. 768], black stripe [*Phytophthora palmivora, P. meadii* and *P. heveae*: ibid., viii, p. 674], and pink disease [*Corticium salmonicolor*]. No direct proof, however, was obtained that this so called 'forestry' type of plantation favours the spread of root disease, the available evidence indicating the contrary.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, pp. 108–119, 2 figs., 1933.

The most salient features of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xii, p. 354] situation in England in 1932 were the severe attacks which occurred on the crown of the 'hill' (rootstock) in winter and on the bine in early summer, and the check which the disease sustained later as a result of hot weather.

In one garden (planted with Bramling and Cobb hops) the disease was found during February to be killing the hills and roots. The mycelium was deep-seated in the tissues of the strap cuts, some of which were black and rotting, and was also present in roots 1 in. in diameter and in smaller roots to a distance of 6 in. from the point of origin. This is thought to be the first case of the kind recorded in England. Under the conditions prevailing in hop nursery beds, it is very probable that new hop gardens are planted up with material already seriously diseased.

Up to June the disease progressed steadily, but June was dry, sunny, and hot, and the angular leaf spot stage became suppressed. The subtending leaves at the nodes where lateral spikes were present were usually invaded through the petioles, spores being produced in lines adjoining the main veins. With warm, dry weather during the first three weeks of July little further spread occurred on the bine, the fungus dying out in most of the spikes left.

When terminal and lateral spikes had been removed complete control was given by three spray applications [ibid., x, p. 406]. Extra sprayings given by some growers before the bine had reached the top caused scorching of the young leaves, but no deleterious effects followed. Further evidence was obtained that spraying during burr is not injurious.

As there were 109 rainy days from April to September, 1932, but little loss from the disease, compared with 111 in 1927 when infection was severe, it is evidently not the total number of wet

days but the time of their occurrence in relation to the growth stage reached that influences attack by downy mildew.

HEMMI (T.) & KURATA (S.). **Studies on septorioses of plants. V. Septoria menthae (Thüm.) Oud. causing the serious leaf-spot disease of cultivated Mints in Japan.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 10–19, 6 figs., 1933.

Cultivated mints in Japan are stated to be widely and destructively attacked by *Septoria menthae*, which produces on both leaf surfaces circular or semicircular, dark brown or greyish-black, later white to greyish-white spots with a blackish-brown margin. The morphological and cultural characters of the fungus are described. Pycnidia and pycnospores are readily formed on potato decoction agar. The optimum temperature for growth appears to be about 24° to 28° C. Inoculation experiments on the leaves of French and German species of mints gave positive results after an incubation period of some twelve days.

Experiment Station notes. Cane diseases.—*South African Sugar Journ.*, xvii, 9, p. 465, 1933.

A few further cases of streak disease have been reported in P.O.J. 2725 sugar-cane on Reunion flats, Natal [*R.A.M.*, xii, p. 658], but the resistance of the variety appears to be considerable. Co. 281 has been found rather more susceptible to mosaic than Co. 290 or P.O.J. 2725, 2714, or 2878 under local conditions, and hence its release has been delayed. Here again, however, there is no reason to expect heavy losses from this source. The condition known in Cuba as 'cold chlorosis' [ibid., xii, p. 786] also occurs in Natal, chiefly on P.O.J. 2725, Uba being moderately susceptible and P.O.J. 2714 and 2878 apparently immune.

MCINTOSH (A. E. S.). **Report of the Geneticist for the year 1932–33.**—*Barbados Agric. Journ.*, ii, 3, pp. 1–32, 2 diags., 1933.

In a further test of the resistance of sugar-cane varieties to *Bacterium vascularum* in Barbados [*R.A.M.*, xi, p. 75], it was found that, judging by the leaf symptoms, susceptibility appeared to be greater in the Barbados commercial varieties and seedlings (Ba. 11569 being the most affected) than in the Javanese varieties of the P.O.J. series (crossings of *Saccharum spontaneum* and *S. barberi* with noble canes), or the Indian (Coimbatore) varieties, or crosses between the Javanese and Barbados varieties. A high percentage of the seedlings from Ba. 11569 × B.H. 10 (12) showed only slight leaf symptoms, the reverse being the case among seedlings derived from Ba. 11569 × Ba. 6032.

In March, 1933, seven to eight weeks after potting, groups of sugar-cane seedlings developed a stunted, withered appearance and a characteristic shortening of the young inner leaves. As the disease progressed, the leaves turned yellowish-brown and withered. The root systems of the affected plants were greatly reduced, frequently discoloured and rotten, and showed the presence of one or more fungi (probably introduced in the potting soil), to which the disease was attributed. By 5th April, some 2,200 seedlings or

12·2 per cent. of the whole had been killed off. As growth progressed the disease became less serious, and after the plants had been transferred to the field no further losses occurred.

COOKE (D. A.). **Relation of Pythium disease to growth failure.** —*Repts. Assoc. Hawaiian Sugar Technologists*, xii, pp. 169–178, 1933. [Abs. in *Facts about Sugar*, xxviii, 12, p. 471, 1933.]

The apparent stimulatory effect of chlorpicrin [see above, p. 98] on the yield of sugar-cane in certain Hawaiian soils has been found to be due to its toxic action on soil fungi, especially the *Pythium* attacking the D. 1135 and P.O.J. 36 varieties [*R.A.M.*, xii, p. 723].

AVERNA-SACCÁ (R.). **Contribuição para o estudo da biologia da Thielaviopsis paradoxa (de Seynes) Höhn., da Bananeira e da Canna de Assucar e sua pretensa relação com o Melanconium sacchari, Massee.** [A contribution to the study of the biology of *Thielaviopsis paradoxa* (de Seynes) Höhn. from Banana and Sugar-Cane and its supposed relationship with *Melanconium sacchari* Massee.]—*Rev. Agric.*, vii, 3–4, pp. 114–130, 13 figs., 1932. [Received November, 1933.]

A full account is given of the writer's studies in Brazil on the biology of *Thielaviopsis* [*Ceratostomella*] *paradoxa*, a pathogen of banana and sugar-cane, with notes on the observations of other workers in the same field. No evidence could be obtained in support of the alleged relationship between this fungus and *Melanconium sacchari*, associated with rind disease of sugar-cane [*R.A.M.*, xi, pp. 542, 543].

SĂVULESCU (T.) & SANDU-VILLE (C.). **Beiträge zur Kenntnis der Micromyceten Rumäniens.** [Contributions to the knowledge of the micromycetes of Rumania.]—*Hedwigia*, lxxiii, 3–4, pp. 71–132, 1933.

Of the 200 species of fungi (mostly Fungi Imperfecti, with a few Ascomycetes) included in this annotated list (bringing the total micromycetes described in Rumania to 342), 25 are described as new and are furnished with Latin diagnoses. A few new forms and varieties are also included.

BLUMER (S.). **Die Erysiphaceen Mitteleuropas mit besonderer Berücksichtigung der Schweiz.** [The Erysiphaceae of Central Europe with special reference to Switzerland.]—*Beitr. zur Kryptogamenflora der Schweiz*, vii, 1, 483 pp., 125 figs., 1 diag., 41 graphs, 1933.

This comprehensive and well illustrated monograph contains, in addition to full descriptions of the Central European (especially Swiss) Erysiphaceae, lists of the principal foreign species of each genus [cf. *R.A.M.*, vi, pp. 124, 643, *et passim*], the perithecial dimensions of many of the described forms on different hosts being shown graphically. Keys are given for the identification of the Central European species.

In the genus *Phyllactinia* Salmon's varieties *subspiralis*, *rigida*, and *angulata* of *P. corylea* [ibid., xii, p. 395] are raised to specific rank, bringing the total number of species referable to this genus to ten, in place of the single one recognized by Salmon.

Host and fungus indices and a 25-page bibliography are appended.

REINKING (O. A.) & MANNS (M. M.). **Parasitic and other Fusaria counted in tropical soils.**—*Zeitschr. für Parasitenkunde*, vi, 1, pp. 23–75, 2 figs., 1933. [German summary.]

A detailed and fully tabulated account is given of the writers' investigations of 15 soils of Honduras and Guatemala (of which 14 were distinct types) for the presence and numbers of parasitic and saprophytic species of *Fusarium*. The methods of sampling and plating are described. The isolations were made on ordinary acidified potato agar (P_H 4 to 4·5).

Fifteen different species and nine varieties or forms, belonging to eight sections (but the majority in *Elegans*), were isolated from the various soil types. Practically all the surface soils yielded *F. dimerum* [*R.A.M.*, xi, p. 709], *F. equiseti* var. *bullatum* [ibid., xiii, p. 3], *F. moniliforme* [*Gibberella moniliformis*], *F. bulbigenum* [ibid., xii, p. 317], *F. oxysporum* form 5, *F. solani* var. *martii* f. 1, and *F javanicum* var. *theobromae* [loc. cit.]. *F. oxysporum* f. 3 [formerly *F. cubense*: ibid., x, p. 626; xii, p. 773] occurred only in the soil surrounding diseased bananas but was found in 12 of the 14 soil types. *F. solani* vars. *minus* [ibid., xi, pp. 695, 709] and *eumartii* were commonly found at greater depths. All the foregoing except *F. oxysporum* f. 3 are provisionally classified as soil-inhabiting species of *Fusarium*, whereas *F. decemcellulare* [*Calonectria rigidiuscula*: ibid., vi, p. 440], *F. chlamydosporum*, *F. semitectum* [ibid., xii, p. 317], *F. camptoceras*, *F. diversisporum*, *F. scirpi* [ibid., xi, p. 504] and its var. *caudatum*, *F. moniliforme* var. *majus*, *F. orthoceras* and its var. *trisepatum* [ibid., x, p. 795], *F. oxysporum*, *F. vasinfectum* var. *lutulatum*, and *F. javanicum* var. *ensiforme* are regarded, by reason of their scarcity and the special local conditions governing their isolation, as mere soil invaders.

Larger average numbers of *F. dimerum* were isolated from the heavier soils, while the six other common species (including *F. oxysporum* f. 3) studied from this standpoint predominated in the soils of lighter texture. The following preferred alkaline soils: *F. dimerum*, *F. equiseti* var. *bullatum*, and *F. solani* var. *martii* f. 1, whereas an acid reaction promoted the growth of *G. moniliformis*, *F. bulbigenum*, *F. oxysporum* 3 and 5, and *F. javanicum* var. *theobromae*.

As mentioned above, *F. oxysporum* f. 3 was isolated, both in these studies and in numerous experiments in various parts of the Caribbean region, exclusively from the soil round diseased bananas. It is apparently a soil invader and a definite parasite, probably introduced into the areas under observation on diseased bananas from the Far East. *F. oxysporum* f. 5 and *F. bulbigenum* were originally described as agents, respectively, of tobacco wilt and bulb rot, but in the present investigations they were common

apart from their hosts, so that no high degree of specialization is indicated.

GIKASHVILI (K. G.) & VARTHAGAVA (T. I.). Грибы, собранные на Чайном кусте на Чаквинских плантациях и в окрестностях Чаквы в период с **23/V** до **23/VI 1930** г. [Fungi collected on the Tea bush on the Tschakva plantations and in the vicinity of Tschakva from 23rd May to 23rd June, 1930.]—*Bull. Res. Inst. for the Tea Indus. in U.S.S.R.*, Tiflis, 2, pp. 11–24, 1931. [Received November, 1933. In the Russian language with Georgian translation, and English summary.]

This is an annotated list of 18 species of fungi which were collected by the authors in the early summer of 1930 on the tea bushes in and around Tschakva [cf. *R.A.M.*, viii, p. 814; ix, p. 412]. In addition to those previously enumerated the list includes *Leptosphaeria cavarae*, *Ascochytella theicola* [ibid., vi, p. 127], and *Phoma ejiciens* Pass., which are stated to be new records for the Caucasus; and also *Phyllosticta theicola* [loc. cit.], *P. plurivora* Woron., *Macrophoma theae* [ibid., viii, p. 204], *Phomopsis theicola* [ibid., ix, p. 564], *Stagonospora theicola* Petch, *Ramularia theicola* [ibid., vi, p. 127], and *Cercoseptoria theae* [see next abstract].

NAGORNY (P. I.) & ERISTAVI (E. M.). Новая для Кавказа болезнь Чайного куста, вызываемая грибком **Cercoseptoria theae (Cav.) Curzi.** [A new disease of the Tea bush in the Caucasus, caused by *Cercoseptoria theae* (Cav.) Curzi.]—*Bull. Res. Inst. for the Tea Indus. in U.S.S.R.*, Tiflis, 2, pp. 3–10, 1 pl., 1931. [Received November, 1933. Summaries in the Georgian and English languages.]

A brief account is given of the tea leaf spot caused by *Cercoseptoria theae* [*R.A.M.*, ix, p. 564] which was observed for the first time in 1928 and again in 1930 in a few tea plantations (exclusively on plants imported from Asia) in Georgia [Transcaucasia]. The macroscopical symptoms of the disease entirely agree with Curzi's description [loc. cit.], as do also the morphological details of the fungus, with the exception that the Caucasian fungus is stated to have somewhat longer conidia (up to 80 μ), consisting occasionally of as many as 10 cells. *C. theae* was for the most part found in association with other fungi, but a closer study showed that it never appeared on the spots primarily caused by another species, while some of the latter frequently developed as secondary infections on the spots caused by it. The disease was especially prevalent in 1930, when it caused fairly severe defoliation of the attacked bushes.

MOORE (E[NID] S.). **The kromnek or Kat River disease of Tobacco and Tomato in the East Province (South Africa).**—*S. Africa Dept. of Agric. Sci. Bull.* 123, 28 pp., 8 pl., 1 chart, 1933.

In the Stockenstrom district of the Eastern Cape Province, South Africa, increasingly serious losses are caused by a virus disease of tobacco known locally as 'kromnek' or Kat River wilt. Virginian tobaccos, which have been grown in the locality for over forty

years, were affected by a 'wilt' in 1905 which, from the published description (C. P. Lounsbury, 'Tobacco wilt in Kat River Valley', *Agric. Journ. Cape of Good Hope*, xviii, pp. 1–22, 1906), was probably the same disease.

The most constant of the extremely variable symptoms of kromnek is stunting. With seedlings, the growth of the whole plant is arrested but in older plants the lower leaves may continue slightly to enlarge, the arrest of the apex and the half-grown leaves resulting in a deeply sunken crown, while the individual leaves, owing to cessation of elongation affecting the midrib before the rest of the blade, become longitudinally 'gathered'. One-sided distortion of the leaf is common as a result of arrest of growth on one side only of the midrib. Twisting may also occur, so that the under surface of the leaf faces upwards. The apex of the stem is often bent over at right angles. Occasionally, as a late symptom especially on larger plants of the yellow type, sunken streaks appear on the stem, while the pith may show dark flecks forming a winding pattern like the trail of an insect, though later they coalesce into a uniformly dark grey area and cavities develop, separated by disks of darkened pith tissue. There is no obvious discoloration of the xylem. Affected Burley tobaccos sometimes show a naked stem and a crown of arrested bud leaves; in other varieties the leaves below the point of infection are retarded, yellow, and brittle. The first leaf above this point may appear normal, but the second and subsequent leaves develop ring spot or vein markings, or both, the youngest bud leaves becoming mottled. Kromnek is worst in early summer, both in the seed-beds and among young transplants, those planted out in November sometimes showing up to 95 per cent. diseased, while January plantings are usually free from infection. Yellow varieties are the most susceptible.

The disease was shown by transmission experiments to be due to a virus and further experiments indicated that a destructive disease of tomatoes in the same locality is due to the same virus. The first symptom on tomatoes is the rigidity and peculiar dull grey-green of the upper leaves; the rachis becomes recurved and the leaflets are inrolled upwards. Apical growth ceases, the short internodes producing a bunched effect accentuated by the forced development of the lateral shoots. Sunken necrotic spots and streaks develop later in the cortex of the rachis and stem. Fully grown leaves remain normal but younger ones may be malformed, with deeply sunken veins, the surface between being blistered and uneven. The under surface of the young leaflets is often purple, while rather older leaves are sometimes bronzed and may develop a uniform scorching. After being arrested for a few weeks the plants generally resume growth, the new leaves often being misshapen and puckered and sometimes mottled and blistered. Undersized fruits free from markings may be produced. In tomatoes grown under shade bronzing is usually absent and bunching less obvious; they make fair growth and may set a moderate crop. In seed-bed attacks the writer has seen 100 per cent. loss in seedlings a few inches high. All the varieties tested appeared to be equally susceptible.

Kromnek tobacco grafted on to healthy tomato produced symptoms typical of the tomato disease, and conversely. Tobacco kromnek was not transferred to tomato by juice inoculation, but the reverse inoculations were successful, severe and characteristic symptoms appearing in a few days. As the juice of tobacco plants inoculated from tomato produced systemic infection on other tobacco plants when rubbed on to them, and this was the only instance out of very numerous attempts in which infection was passed by means of juice inoculation from diseased to healthy tobacco, the virus appears to be more virulent when extracted from tomato than when obtained from tobacco. Juice inoculations from tomato to tomato are fairly easily obtained.

From the published description, tomato bunchy top in the eastern Transvaal [*R.A.M.*, xi, p. 481] resembles kromnek except for the absence of bronzing and leaflet rolling and differences in the necrotic leaf markings. Tomato spotted wilt in Australia and England [ibid., xi, p. 549; xiii, p. 8] is also very similar to the South African tomato disease in symptoms, general behaviour, and host range, but the symptoms on some hosts are different.

Experiments showed that tobacco kromnek is not seed- or soil-borne, but both the tobacco and the tomato disease are transmissible by grafting, and by an undetermined species of *Franklíniella* which is the chief, and possibly the only, source of spread in the field. The natural hosts of the virus, as shown by grafting and insect transmission experiments from diseased plants found in the field, include *Datura stramonium*, *Nicandra physaloides*, *Physalis minima*, *P. peruviana*, and *Solanum nigrum*; *S. pseudocapsicum* and potato were infected artificially.

Spread appears to be checked by high temperatures. Partial recovery is not uncommon, but the virus was ascertained by grafting to be present in the new growth of 'recovered' tobacco plants and they may later develop fresh kromnek symptoms [ibid., x, p. 614].

Some control is given by making the tobacco seed-beds late and deferring the first planting until late November or December; meantime, attempts are in progress to develop a resistant variety.

WOODS (M. W.). **Intracellular bodies associated with ring-spot.**—*Contrib. Boyce Thompson Inst.*, v, 3, pp. 419–434, 2 figs., 1933.

Intracellular bodies, closely resembling those associated with other virus diseases of plants, were found by the writer at College Park, Maryland, in the cells of the primary and systemic lesions of ring spot in Turkish tobacco and the primary lesions in Havana Seed-leaf tobacco, *Nicotiana rustica*, *N. glutinosa*, and *Petunia* sp. [*R.A.M.*, xii, p. 120]. The bodies are uniform, spherical or oval, densely granular, vacuolate, and contain numerous minute, apparently crystalline, cuboidal bodies, staining vividly with safranin. They are confined to the visibly lesioned areas included within one or two necrotic rings in which cellular disintegration is in active progress. The rapidity of development of the intracellular bodies after inoculation seems to depend rather on the metabolic condition of the host cells than on the length of time that the cells remain exposed to the virus. The purity of the virus in the affected plants was demonstrated by tests, details of which are given. The

bodies are considered to represent the formation and accumulation of certain materials in the cytoplasm of the diseased cell, which generally congregate near the nucleus. They were observed with and without membranous peripheries in both young and old lesions.

MOORE (ENID S.). **Wildfire of Tobacco on Nicandra physaloides.**—*Nature*, cxxxii, 3335, p. 517, 1933.

Attention is drawn to the detection, in the late summer of 1932, of spontaneous infection by wildfire (*Bacterium tabacum*) on the annual Solanaceous weed, *Nicandra physaloides*, in the tobacco plantations at Balfour, East Cape Province, South Africa. The spots on the leaves are rounded, 1·5 to 10 mm. (average 6 to 7 mm.) in diameter, dull brown with a dark edge, usually concentrically zonate but devoid of the well-marked halo characterizing the wildfire lesions on tobacco. Inoculation experiments with the organism from *N. physaloides* produced the typical symptoms on the same host and on tobacco, the latter showing the characteristic halo. The bacterium was re-isolated from both plants and re-inoculated into tobacco and *N. physaloides* with positive results. The similarity of cultural features leaves no doubt as to the identity of the organism.

ADAM (D. B.). **Blue mould of Tobacco. On the morphology of the fungus and its nomenclature.**—*Journ. Dept. Agric. Victoria*, xxxi, 8, pp. 412–416, 1 fig., 1933.

In giving a critical summary of the literature dealing with species of *Peronospora* on *Nicotiana* spp., the author states that the first record of a fungus of this genus on tobacco in Queensland was made by Tryon in 1890, Cobb a year later describing it as apparently the same as *P. hyoscyami*, a name which is also applied to the Australian specimens of tobacco mildew in the Kew Herbarium. In Gäumann's Monograph [*R.A.M.*, iii, p. 241], however, all the records of *Peronospora* on *Nicotiana* are considered to be referable to *P. nicotianae* Speg.

A detailed morphological description is given of the fungus causing the blue mould disease of tobacco in Australia [ibid., xi, p. 408]. In freshly collected material only the conidial stage has been found, but badly mildewed leaves developed the previously unknown sexual spores on keeping in the dark for a fortnight, and these organs have since been repeatedly obtained by keeping the leaves very moist in Petri dishes. The fungus differs from *P. nicotianae* [ibid., iv, p. 573] in the shorter and less acute ultimate branchlets of its conidiophores, its larger conidia (22 by 17, as against 19 by 10 μ), its smaller oospores (35 to 60, compared with 50 to 80 μ in Spegazzini's species, material of which was obtained for comparison), with a smooth or slightly roughened epispore whereas that of *P. nicotianae* is closely and regularly warted or areolate. The oospores of the Australian fungus are distinctly larger than those of *P. hyoscyami* as described by Bakhtin [ibid., vii, p. 270; cf. also xii, p. 732], and it failed to infect *Hyoscyamus niger* under controlled conditions. For these reasons the Australian fungus is considered to be a distinct species and is named *P. taba-*

cina n. sp., a Latin diagnosis being appended. In artificial inoculation experiments the fungus was found to cause infection on tobacco, *N. glauca*, *N. suaveolens*, *N. rustica*, and *N. longiflora*, that is on all the species of this genus which were tested, and it is mentioned that McAlpine recorded '*P. hyoscyami*' on *N. suaveolens* in 1899 and considered that it had spread to the introduced tobacco from this native host.

OGILVIE (L.). **Ring spot or spotted wilt of Tomatoes and ornamental plants.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 121–122, 2 pl., [1933].

In 1932, spotted wilt of tomatoes [*R.A.M.*, xii, p. 59; see also above, p. 131] was present in at least two localities in Somerset. In one greenhouse it was found on *Streptosolen jamesonii*, *Schizanthus* sp., *Browallia speciosa major*, *Trachelium* sp., begonias, and *Campanula pyramidalis*. In a commercial nursery a large number of dahlias were affected. Attention is drawn to the possibility of widespread dispersal by the sale of such plants.

RISCHKOW (V.), KARATSCHEVSKY (J.), & MICHAILONA (P.). **Ueber die Fruchtverholzung bei Tomaten. Vorläufige Mitteilung.** [On the woodiness of fruit in Tomatoes. Preliminary note.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 496–498, 1933.

A brief description is given of a disease of tomatoes, believed to be a previously undescribed virus disease, in the Crimea, characterized by 'woodiness' of the fruit, as reported [from Australia] in passion-fruit [*Passiflora edulis*: *R.A.M.*, xiii, p. 44]. The leaves of young shoots turn white under the influence of the disease (locally known as 'stolbur'), which further induces an abnormal elongation of the sepals and proliferation of the ovules [cf. ibid., xiii, p. 62]. In these particulars the tomato disorder, probably a representative of the 'yellow' group, resembles the teratological manifestations described by V. Ghimpu and D. Kostoff on virus-infected tobacco [ibid., xii, pp. 581, 728], and the authors observed a severe outbreak of a similar condition in tobacco coincident with the development of the tomato disease. 'Woody' tomato fruits and stems show an abnormally extensive development of the lignified tissue of the vascular bundles and especially of the pericyclic fibres, and other anatomical modifications. The carbon-nitrogen quotient of diseased plants is larger than in healthy ones, amylase activity also being higher in the former. The infectivity of the disease was demonstrated by successful grafting experiments; it is probably disseminated by insects in nature.

SCHMIDT (M.). **Zur Entwicklungsphysiologie von Cladosporium fulvum und über die Widerstandsfähigkeit von Solanum racemigerum gegen diesen Parasiten.** [On the physiology of development of *Cladosporium fulvum* and on the resistance of *Solanum racemigerum* to this parasite.]—*Planta*, xx, 3, pp. 407–439, 21 figs., 1933.

Continuing the studies initiated by R. v. Sengbusch and N. Loschakowa-Hasenbusch on the factors governing the resistance

of tomatoes to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xii, p. 250], the writer undertook a further series of investigations at the Kaiser Wilhelm Institute for Breeding Research, Müncheberg, Mark Brandenburg, on the physiology of the fungus and the nature of resistance to it in *Solanum racemigerum*.

The fungus was grown on a number of media, full details of the cultures being given. On citric acid (2 per cent.) agar no spores germinated. In leaf decoctions of Bonny Best sporulation took place but no spores were produced in those of *S. racemigerum*, though there was some spore production in the latter when 2 per cent. agar was added, due apparently to the failure of the preventive mechanism in contact with the solid. In the leaf decoctions of Bonny Best and certain other varieties, e.g., Plum-shaped Yellow and Danish Export, and in the expressed sap of the leaves, stem, and roots of the first named, the hyphae assumed a remarkable antlered appearance and failed to attain the normal length. No spores germinated in the sap of *S. racemigerum* but hyphae of the Bonny Best type and normal spores were produced in root decoctions of *S. racemigerum* and a few germinated in decoctions of the stem of this species. The spores of *C. fulvum* did not germinate in decoctions from the ripe fruit either of susceptible varieties or of *S. racemigerum*, but normal hyphae developed in the expressed sap of the fruit flesh and fruit wall of both Bonny Best and *S. racemigerum*. In unripe and semi-ripe fruit decoctions the hyphae were of the antlered Bonny Best type. In leaf decoctions of the cultivated potato, *S. demissum*, *S. chacoense*, *S. neoweberbaueri*, and *S. wittmackii* antlered hyphae were produced, whereas the normal type developed in tuber decoctions of *S. tuberosum* and in a decoction of *S. muricatum* leaves. The ordinary long, slender hyphae of *C. fulvum* were further formed in tobacco leaf decoctions, while a tendency to antlering was shown in those of *Nicotiana affinis*. Normal hyphae developed in decoctions of the seven non-Solanaceous plants tested.

Tests to determine if the production of the antlered hyphae was connected with the presence of solanin showed that this substance in a pure form prevents germination at high concentrations and causes antlering of the hyphae produced by the germ tubes at low ones. On the precipitation of solanin out of Bonny Best leaf sap by means of tannin, normal hyphal formation occurred in the filtrate. The addition of manganese sulphate entirely counteracted the effects of solanin in the unripe fruit decoction of Bonny Best tomatoes and permitted the formation of typical hyphae. Atropin and saponin both exerted a similar action on *S. racemigerum* sap; the former stimulated germination in tobacco decoction and the latter in all the media used. The gradual dilution of solanin-containing substrata by those of the type producing normal hyphae led to a corresponding transition from the antlered to the typical form.

The anti-germination principle residing in *S. racemigerum* (which contains no more solanin than Bonny Best so that this substance cannot be responsible) is temporarily named 'prohibitin' and is a water-soluble substance, the physiological efficacy of which is counteracted by 20 to 30 minutes' heating to a temperature of

100°, as well as by precipitation of the leaf decoction with tannic acid.

MAXWELL (H.). **The Sycamore fungus.**—*Nature*, cxxxii, 3332, p. 409, 1933.

Attention is drawn to the absence from sycamore (*Acer pseudoplatanus*) plantations at Corrour, Inverness-shire (1,200 to 1,400 ft. above sea level) of the leaf blotch fungus *Rhytisma acerinum* [*R.A.M.*, xi, p. 547], which is constantly present on the trees elsewhere, being apparently regarded almost as a natural feature. The groves under observation are only 20 to 30 years old, the ground having been practically treeless before the experimental plantings were made.

DEMAREE (J. B.). **Progress of Pecan roset control.**—*Proc. 27th Ann. Convent. Georgia-Florida Pecan Growers' Assoc.*, pp. 38, 40, 42–43, 45, 1933. [Abs. in *Chem. Abstracts*, xxvii, 22, p. 5880, 1933.]

Zinc sulphate, applied to the soil or placed in holes in the trunks of pecan [*Carya pecan*] trees towards the end of March or early in April, largely prevented the development of rosette [*R.A.M.*, xii, p. 602], die-back, and leaf-spotting fungi [e.g., *Cladosporium effusum* and *Mycosphaerella dendroides*: ibid., xi, p. 213]. Spraying with the same preparation gave only temporary benefit.

HEMMI (T.). **On Stereum induratum Berk. and Trametes dickinsii Berk. causing dry-rot of Fagaceous woods.**—*Forsch. auf dem Geb der Pflanzenkrankh.*, [Kyoto], ii, pp. 328–333, 1 pl., 2 figs., 1933. [Japanese, with English summary.]

Notes are given on the results of the writer's studies in Japan on the wood-rotting fungi, *Stereum induratum* and *Trametes dickinsii*, of which the former is widely distributed round Kyoto and in Shikoku and causes a white pocket rot of oaks (*Quercus gilva*, *Q. stenophylla*, and *Q. myrsinaefolia*). The pockets are scattered throughout the wood and are filled with snow-white cellulose fibres, while the intervening network of sound tissue is comparatively thin. *T. dickinsii* is the agent of a brown, cubical rot apparently confined to the Fagaceae, represented in the writer's collection by oak, chestnut, beech, and *Pasania*.

FRITZ (CLARA W.) & ROCHESTER (G. H.). **Red stain in Jack Pine. A comparative study of the effect of Trametes pini and a second red-staining fungus on the strength of Jack Pine.**—*Dept. of the Interior, Canada, Forest Service Circ.* 37, 15 pp., 2 pl., 4 graphs, 1933.

Jack pine [*Pinus banksiana*], an important timber for railway sleepers in Canada, is liable throughout its entire geographical range, from the east coast to the middle west, to a disease known as 'red stain' which may be caused either by *Trametes pini* or by an as yet unidentified organism provisionally named fungus No. 2 [*R.A.M.*, xii, p. 344]. The former eventually produces a white pocket rot (after six to nine months in the malt agar culture experiments herein described), while the action of the latter is

apparently confined to discoloration of the wood. The colour of the stains caused by both the fungi ranged from red to orange with an admixture of neutral grey, that of No. 2 tending to be more vivid than that of *T. pini*.

A study of 444 pine blocks showed that 12 months' exposure to *T. pini* results in a considerable reduction both of strength in compression parallel to grain and in specific gravity, the former effect being noticeable after three months while the latter only became apparent after six months. No adverse effects followed the exposure of the blocks to fungus No. 2 under comparable conditions.

Some evidence was obtained that selection of *P. banksiana* for resistance to decay may be based on a rapid growth rate (12 to 16 rings per in.), but this cannot yet be taken as conclusive.

TUBEUF [C. v.]. **Studien über Symbiose und Disposition [für Parasitenbefall] sowie über Vererbung pathologischer Eigenschaften unserer Holzpflanzen. IV. Disposition der fünfnadeligen Pinus-Arten einerseits und der verschiedenen Ribes-Gattungen, Arten, Bastarde und Gartenformen andererseits für den Befall von Cronartium ribicola.** [Studies on symbiosis and tendency to parasitic infection and on the inheritance of pathological characters in our woody plants. IV. The tendency of the five-needled species of Pine, on the one hand, and of the various genera, species, hybrids, and horticultural forms of *Ribes*, on the other, to attack by *Cronartium ribicola*.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 433-471, 1933.

On the basis of five years' experiments in Germany [the results of which are fully discussed and tabulated] and of a study of the relevant literature, the writer has compiled a survey of the varietal reactions of currants, gooseberries, other species of *Ribes*, and five-needled pines to blister rust (*Cronartium ribicola*) together with a note on the varietal susceptibility of gooseberries to American mildew (*Sphaerotheca mors-uvae*) in 1931–2. Keys are given for the determination of the pines belonging to the sections *strobus* and *cembra*.

TUBEUF [C. v.]. **II. Nachtrag zu Studien über Symbiose und Disposition für Parasitenbefall sowie über Vererbung pathologischer Eigenschaften unserer Holzpflanzen. III. Untersuchungen über Zuwachsgang, Wassergehalt, Holzqualität, Erkrankung und Entwertung geharzter Fichten.** [Second supplement to studies on symbiosis and tendency to parasitic infection and on the inheritance of pathological characters in our woody plants. III. Investigations on incremental growth, water content, quality of wood, disease, and degeneration of Spruces denuded of resin.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 476–484, 8 figs., 1933.

Of 50 spruces examined in the winter of 1932–3, 17 years after resin extraction, 28 (56 per cent.) showed a decay of the butt, which was found in five of the affected trees to be due to *Trametes*

radiciperda [*Fomes annosus*: *R.A.M.*, xii, p. 727]. The fungus had mostly extended a considerable way up the trunk, being found in one case at a height of 8·30 m. Five other trees were also suffering from an upward spreading butt rot due to an unidentified fungus.

WAŁEK-CZERNECKA (ANNA). **Grzyby niszczące podkłady kolejowe w Polsce.** [Fungi that destroy railway sleepers in Poland.]—*Acta Soc. Bot. Poloniae*, x, 2, pp. 179–290, 8 pl., 44 figs., 1933. [French summary.]

The bulk of this paper is given to a detailed and fully illustrated description of the development in pure culture on synthetic and natural substrata of 21 species of Basidiomycetes which were isolated by the author from decaying railway sleepers in Poland, and some of which were maintained in culture for periods of over two years. The species most frequently found on fir sleepers were *Lentinus squamosus* [*L. lepideus*], *Paxillus acheruntius* [*P. panuoides*: *R.A.M.*, ix, p. 422], *Coriolus* [*Polystictus*] *versicolor*, *Poria vaillantii* [*P. vaporaria*], *P. callosa*, and *Trametes squalens*, among which the first named is stated to be the most frequent and most dangerous, inasmuch as it readily rots both sapwood and the heartwood. Oak sleepers were found to be attacked chiefly by *Daedalea quercina*. All the species, with the exception of *Armillaria mellea* and *P. mucida*, produced fruiting bodies in pure culture.

In discussing the mycelial characters of the fungi in pure culture on blocks of wood, the author states that she found the 'medallion' clamps first described by Falck in species of *Lenzites* and considered to be typical of this genus, to be much more common among lignivorous fungi than was hitherto believed, since she observed them in *L. sepiaria*, *Lentinus lepideus*, *T. trabea*, *Leptoporus* [*Polyporus*] *destructor*, *Poria vaporaria*, *P. callosa*, and *D. quercina*. She was also able to confirm Falck's account of the origin and morphological features of the chlamydospores which develop on the mycelium submerged in agar media. Similar chlamydospores occur inside the wood cells attacked by *P. vaporaria*, and also on the aerial mycelium of *T. squalens* growing on agar.

RHODES (F. H.) & ERICKSON (I.). **Efficiencies of tar oil components as preservative for timber.**—*Indus. & Engin. Chem.*, xxv, 9, pp. 989–991, 1933.

Continuing the investigations of Rhodes and Gardner on the relative toxicity to *Fomes annosus* of various coal-tar compounds [*R.A.M.*, ix, p. 619], the writers tested the preservative efficiencies of distilled dead oil (190° to 310° C.) with the addition of known amounts of *m*-cresol, *o*-cresol, diphenyl, naphthalene, α-methyl-naphthalene, and β-methyl-naphthalene. It was found that none of the substances in question is primarily responsible for the preservative action of the oil. In general, naphthalene and the methyl naphthalenes have about the same preservative efficiency as the lower fractions of the normal dead oil, the toxicity of which is not increased by their addition. Phenol and cresol are no more effective as fungicides than are the neutral aromatic hydrocarbons, so that any advantage accruing from the presence of the tar acid

in the oil must be due to causes other than the increase of fungicidal capacity. Diphenyl alone among the compounds studied shows slightly more than the average preservative efficacy.

The oils from water-gas tar were found to be only about half as effective preservatives as those from coal-tar; the fraction distilling between 247° and 260° has a definitely higher preservative power than any other. The chloronaphthalenes were found to be slightly more toxic than naphthalene itself.

GREAVES (C.). **Leaching tests in water-soluble wood-preservatives.**—*Dept. of the Interior, Canada, Forest Service Circ.* 36, 15 pp., 1 fig., 1933.

A detailed, fully tabulated account is given of the writer's tests to determine the comparative resistance to leaching-out of four water-soluble preservatives used in the treatment of white pine [*Pinus strobus*], viz., zinc chloride (2 per cent.), sodium fluoride (1·5 per cent.), copper sulphate (2·5 per cent.), and dinitrophenol (0·4 per cent.).

Neither zinc chloride nor sodium fluoride proved very resistant to leaching-out, up to 86 per cent. of the former and 81 per cent. of the latter being lost from blocks 3·65 in. in diameter. Determinations of the zinc and chlorine contents of the same pieces of wood showed that the chlorine is more readily washed away than the zinc, whence it may be inferred that the good service results given by zinc chloride treatment are due to the retention of the zinc as insoluble basic chlorides. A preliminary injection of seasoned wood with crude oil before the usual zinc chloride treatment was found to be very effective in decreasing lixiviation. A second treatment with insoluble copper ferrocyanide completely prevented the leaching out of copper sulphate, 13 per cent. of which was lost from the blocks not receiving the supplementary application. The amounts of dinitrophenol leached out were 41·3 and 44·3 per cent,, respectively, in two lots of blocks, figures comparing favourably with those obtained for zinc chloride and sodium fluoride, especially in view of the greater severity of the dinitrophenol tests [cf. *R.A.M.*, xii, p. 342].

KALSHOVEN (L. G. E.). **Een nieuw middel voor houtconserveering: het xylamon.** [A new preparation for wood preservation: xylamon.]—*De Bergcultures*, vii, 36, pp. 1006–1008, 1933.

Details are given of the various brands of xylamon [*R.A.M.*, xi, p. 414] now on the market from the Consolidirte Alkaliwerke, Westeregeln, Magdeburg, Germany, with notes on the applicability of each for different purposes in timber preservation. Xylamon-paste, incorporated with xylamon-natur, is specially recommended for protection against fungi; the latter is the cheapest of the available preparations, its price in the Dutch East Indies being Fl. 2·70 per 5 kg. The name xylamon is stated to represent a group of chemical products known as 'chlorinated carburetted hydrogens' and consisting of thinly fluid oils with a characteristic pungent odour. They are insoluble in water and may therefore be safely used in bathing establishments and the like. Xylamon

should be applied to dry, rough surfaces at the rate of 1 kg. per 4 sq. m., two to three times as much being necessary for smooth surfaces.

Vegetable diseases. A brief summary.—*Min. of Agric. & Fish. Bull.* 68, 38 pp., 1933.

An annotated list is given of the fungous, bacterial, virus, and physiological diseases affecting vegetables (including rhubarb and tomatoes) in Great Britain, based on information collected over a lengthy period by the Plant Pathological Laboratory of the Ministry of Agriculture. To the standardized common names of the diseases [*R.A.M.*, xii, p. 233] is added the scientific name of the pathogen (where one is concerned), the symptoms are concisely described in semi-popular terms, and control measures are briefly indicated. The bibliography comprises 156 titles.

OGILVIE (L.) & MULLIGAN (B. O.). **Progress report on vegetable diseases. IV.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 103–120, 4 pl., [1933].

This report contains among others the following items of phytopathological interest. Halo blight (*Bacterium medicaginis* var. *phaseolicola*) of dwarf beans [*Phaseolus vulgaris*] was again prevalent in the Evesham area [*R.A.M.*, xi, p. 759]; the Black Wonder, Ne Plus Ultra, and Superlative varieties again showed satisfactory resistance, and to these are now added Abondant, Black Prince, and Unrivalled. The disease occurs on most of the common varieties of runner beans [*P. multiflorus*] in the Evesham area, but on these systemic infection is uncommon and there is little check to growth. In certain areas on the banks of the Severn large patches of runner beans showed a wilt associated with a *Fusarium*.

The most serious disease of lettuce in the Bristol district was a dying-off of winter varieties which was often prevalent in early spring. The decay usually commences in the older, moribund leaves and thence penetrates the stem, resulting in a pinkish rot. Most of this stem-rotting is now attributed to a *Botrytis*, not to the organism resembling *Bacterium vitians* that was previously thought to be responsible [ibid., xi, p. 144].

Comparison with *F. martii* var. *pisi* (isolated in the United States) of the *Fusarium* associated with a foot rot of peas [loc. cit.] indicated that they were probably identical. Severely affected plants also showed the presence of *Heterodera schachtii* on the roots, but the part played by the eelworm has still to be ascertained. In a pot test with peas grown from seed taken from pods heavily infected with both *Ascochyta pisi* and *Mycosphaerella pinodes* [ibid., xi, p. 759], disinfection of the seed with ceresan and potassium permanganate gave 68 and 62 per cent. healthy plants after 68 days, as compared with only 18 per cent. in the untreated controls. Seed taken from pods of Union Jack peas infected with *A. pisi* or *M. pinodes* and kept on damp filter paper for eight days at room temperature gave 50 and 54 per cent. infected seedlings, respectively, the corresponding figures for the Radio variety being 60 and 62 per cent.

GOUMY (H.). **Principales maladies des légumes d'arrière-saison.** [The principal diseases of late-season legumes.]—*Journ. d'Agric. Prat.*, N.S., xcvii, 34, pp. 180–181, 1933.

Popular notes are given on the symptoms and control of the following diseases of late-season vegetables in France: celery rust [*Septoria apii*: *R.A.M.*, xii, p. 743], spinach mildew [*Peronospora effusa*: ibid., xii, p. 417], bean [*Phaseolus vulgaris*] anthracnose [*Colletotrichum lindemuthianum*] and rust [*Uromyces appendiculatus*], and tomato canker [*Didymella lycopersici*], septoriosis [*Septoria lycopersici*], and mildew [*Cladosporium fulvum*: ibid., xiii, p. 10 *et passim*].

ROCHLIN (E[MILIA] J.). К вопросу о невосприимчивости крестоцветных к **Plasmodiophora brassicae Wor.** [On the question of the non-susceptibility of Cruciferae to *Plasmodiophora brassicae* Wor.]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 8–31, 2 pl., 7 figs., 1933. [English summary.]

The results of experiments in 1930 and 1931 in the neighbourhood of Leningrad, in which 47 cultivated and wild species belonging to 14 genera of the Cruciferae were tested for their relative susceptibility to infection with *Plasmodiophora brassicae* [cf. *R.A.M.*, xii, p. 607; xiii, p. 2] in naturally infected soil to which cultures of the organism were added, showed that the reaction varied from complete immunity in some to complete susceptibility in others, independently of their taxonomic position, all gradations of susceptibility occurring within one and the same genus (e.g. *Brassica nigra* none infected, *B. oleracea* 100 per cent.; *Barbarea vulgaris* 0, *B. rupicola* 99 per cent.; *Cochlearia officinalis* 0, *C. danica* 75 per cent.; *Hesperis alpina* and *H. fragrans* 0, *H. lutea* 100 per cent.). A comparative study of the anatomical details of the plants indicated that in the early stages of growth their immunity or susceptibility is not related to any marked differences in the structure of their roots which, under natural conditions, are the first organs to be attacked by the parasite through the root hairs [ibid., x, p. 3; xi, p. 16] and epidermal cells, entry through which was observed by the author. In adult plants, however, the penetration and spread of *P. brassicae* was found to be hindered to a certain degree by the development of layers of cork, by the collenchyma, and by the more compact structure of the wood layers. Inside the tissues the organism spreads both by migration and by division of the invaded cells; there was evidence that it has a disintegrating effect on the walls of the host cells, the chemical composition of which it is able to alter.

A direct relationship was found between the degree of resistance exhibited by a given species and the amount contained in it of those glucosides which on fermentation with myrosin produce highly pungent mustard oils. Chief among such glucosides in the Cruciferae are stated to be sinigrin which is present in many species, particularly in *Brassica nigra* and horse-radish, and in smaller amounts in *Sinapis* [*B.*] *juncea*, *B. rapa*, *B. napus*, &c.; gluconasturtiin in *Barbarea praecox* and *Nasturtium officinale*; glucotropaeolin in *Lepidium sativum*, and glucocochlearin. Sinalbin, a glucoside present in *B. alba*, does not yield a pungent

mustard oil, and was not found to protect against infection with *P. brassicae*. An indication of the possible use of the active glucosides or their derivatives as fungicides was obtained in a small experiment, needing confirmation on a larger scale, in which seeds of the very susceptible Brunswick cabbage were sown in highly infected soil, in pots, some of which were abundantly watered with a water extract from *B. nigra* seeds. In these the cabbage seedlings only gave 20 per cent. infection, the sole symptom of which was a very slight swelling of the roots, while in the control pots all the seedlings were severely infected.

From a practical point of view the results of this investigation are believed to indicate the possibility of controlling club root in the Cruciferae by crossing the species deficient or less rich in the active glucosides with those that contain higher amounts of them, and a brief reference is made to the results obtained by G. D. Karpetchenko, of the Pan-Soviet Plant Breeding Institute, who succeeded in obtaining tetraploid hybrids of radish and cabbage exhibiting new morphological, anatomical, and physiological features, and which were further successfully crossed with mustard, swedes, turnips, wild radish, and Chinese cabbage.

Naoumova (Mme N. A.). К выяснению влияния почвенных факторов на развитие килы крестоцветных. [Contribution to the knowledge of the influence of soil factors on the development of club root in the Cruciferae.]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 32–50, 3 pl., 2 graphs, 1933. [English summary.]

Details are given of experiments in the neighbourhood of Leningrad, in which healthy 30-day-old seedlings of the Brunswick cabbage, highly susceptible to *Plasmodiophora brassicae* [see preceding abstract], were planted in containers with two different types of soil, namely a heavy argillaceous, and a light kitchen-garden soil, rich in humus, both of which were then inoculated with similar amounts of the club root organism, and the hydrogen-ion concentration adjusted to comparable P_H values. In preliminary tests, the development of infection appeared to be much more vigorous in the kitchen-garden soil (80·2 per cent.) than in the argillaceous (33 per cent.), a fact which may be correlated with the different degrees of hygroscopicity (7·17 and 4 per cent., respectively) and the different water-holding capacity (125·5 and 32·97 per cent., respectively) of the two soils.

The results of the main experiments showed that in both types of soil the cabbage seedlings were infected within a range of soil moisture from 45 to 100 per cent. of the total water-holding capacity, with an optimum at 80 per cent.; at 30 per cent. no development of the disease resulted. The cabbage seedlings exhibited a strong response in the anatomical features of their roots to variations of soil moisture and reaction. With a water content of about 45 per cent. the roots assumed a xerophytic type which, as the amount of water in the soil increased to 80 per cent., gradually changed to a hydrophytic type. The addition of sulphuric acid tended to have an effect similar to that of excess of water, while sodium carbonate had the reverse effect. It was

further shown that the development of *P. brassicae* inside the host tissues is to a certain degree governed by the anatomical structure of the latter [loc. cit.], inasmuch as the mechanical elements present in the roots of the xerophytic type appear to resist the penetration of the parasite. Infection of the seedlings occurred within a range of P_H values from 5·7 to 8·4, with an optimum near neutrality. The reduction in incidence was most pronounced on the alkaline side of the scale.

The whole investigation is considered to indicate that the intensity of infection of a susceptible host with *P. brassicae* is a function of many intimately connected external factors, such as the degree of infection of the soil, its moisture content and reaction, the anatomical structure of the host, and the like, and is not dependent on the hydrogen-ion concentration of the soil alone.

FEDOTOVA (Mme T. I.). К методике определения зараженности почв килою (**Plasmodiophora brassicae Wor.**). [Contribution to the evolvement of a method for the evaluation of soil infection with club root (*Plasmodiophora brassicae* Wor.).]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 51–81, 1 pl., 5 figs., 1 graph, 1933. [English summary.]

After a brief reference to the practical importance, for control purposes (especially in seed-beds and garden plots), of an accurate estimation of the degree of infection of the soil with the club root organism (*Plasmodiophora brassicae*) [see preceding abstracts], the author states that none of the methods previously employed in mycological and bacteriological practice tested by her gave satisfactory results. The nearest approximation to a correct computation of the actual number of *P. brassicae* spores in infected soils was obtained by a new and rather complicated double method [a detailed description of which is given]. Briefly stated, this method consists, on the one hand, in the preparation from a water suspension of average soil samples, of a number of microscopical mounts under square cover glasses, stained with cotton blue or neutral red, and in counting the actual number of the spores present in at least twelve optical fields of each mount. On the other hand, portions of the same samples are repeatedly (up to 10 times) washed in equal amounts of water, and the number of spores present in each washing are separately counted and added in a grand total, the results of both operations being then compared and averaged. This method should be supplemented by the determination of the percentage of spores that are in a viable condition in the soil, for which purpose the plasmolysing effect of concentrated sugar solutions on the living spores of *P. brassicae* [*R.A.M.*, viii, p. 747] may be successfully used. Preliminary tests indicated that the soil samples should not be kept for longer than four days under laboratory conditions, as the viability of the *P. brassicae* spores contained in them rapidly declines after this interval.

BAILLIE (D. W.) & MUSKETT (A. E.). **The control of finger and toe of Broccoli in County Down.**—*Journ. Min. Agric. Northern Ireland*, iv, pp. 44–46, 1 pl., 1933.

In a series of tests conducted in 1931–2 at Warrenpoint, County

Down, to determine the relative value of mercuric chloride (1 in 1,000), powdered calomel [mercurous chloride], and slaked lime (4 tons per acre) in the control of club root of broccoli [*Plasmodiophora brassicae*: see preceding abstracts], the first named proved much the most satisfactory [*R.A.M.*, xi, p. 17]. Ninety per cent. of the April Queen and Victory plants so treated produced good heads realizing 1*s.* 6*d.* to 3*s.* per dozen for an initial outlay of 10*d.* per 100 plants.

SNYDER (W. C.). **Variability in the Pea-wilt organism, Fusarium orthoceras var. pisi.**—*Journ. Agric. Res.*, xlvii, 2, pp. 65–88, 3 figs., 1 map, 4 graphs, 1933.

A detailed account is given of the author's cultural and pathogenic studies of 15 strains (isolations) of the pea wilt fungus (*Fusarium orthoceras* var. *pisi*) [*R.A.M.*, xii, p. 547] from eight of the United States, considered to be representative of its distribution. When tested on standard groups of pea varieties the strains gave no indication of variation in host specialization, but they varied somewhat in their relative virulence on a given variety of pea. As a general rule, the differences in virulence were moderate, and further experiments showed that entirely comparable differences frequently occurred between monoconidial lines of a single strain.

In pure culture all the type strains exhibited the same general temperature requirements and had a common optimum range for maximum radial growth, but pronounced differences in colony character were apparent between original isolations from different regions and localities. Monoconidial lines of the strains showed cultural differences of the same order, and it was possible within a given monoconidial line to assemble, through the phenomenon of dissociation, a group of cultures almost representative of the whole range of colony type and virulence exhibited by the original strains. The variations appeared to fluctuate within type limits defined by certain cultural characteristics and by a rather specific behaviour in respect to pathogenicity, and no strain studied was sufficiently divergent to give it specific rank.

A comparison of the pea wilt fungus with other vascular species of *Fusarium*, including strains of *Gibberella saubinetii* and *G. moniliformis*, showed a striking general similarity and overlapping of cultural characters, to such an extent as to render them undifferentiable by the ordinary mycological methods, apart from parasitism. The whole investigation tended to support the findings of Brown [ibid., vii. p. 475] in regard to *F.* [*lateritium* var.] *fructigenum*, and of Leonian [ibid., xi, p. 569] in regard to *G. moniliformis*, and is considered to indicate the advisability of simplifying the existing nomenclature of these organisms.

MAGEE (C. J.). **Chocolate spot of Broad Beans.**—*Agric. Gaz. New South Wales*, xliv, 8, p. 580, 1 fig., 1933.

All attempts to isolate a pathogenic organism from the vivid red to reddish-brown, subcircular to circular spots commonly observed on broad bean [*Vicia faba*] leaves in New South Wales have given negative results, although the lesions appear to be identical with those attributed in England to a bacterium [*Bacillus lathyri*:

R.A.M., xiii, p. 8]. The typical spots were found to develop as a result of experimental infestation of the plants by *Aphis rumicis*, appearing in about two days beneath the glistening smears of honeydew excreted by the insects. It is concluded, therefore, that the chocolate-coloured spots are not symptoms of an infectious disease.

SCHMIDT (E. W.). **Natürliche Feinde einiger wichtiger Schadinsekten der Zuckerrübe.** [Natural enemies of some important pests of the Sugar Beet.]—*Deutsche Zuckerind.*, lviii, 35, pp. 709–710, 16 figs., 1933.

Attention is drawn to the widespread occurrence in German sugar beet fields of the entomogenous fungus, *Botrytis* [*Beauveria*] *bassiana*, which is highly destructive to the beet weevil (*Cleonus* [*Bothynoderes*] *punctiventris*) [*R.A.M.*, ix, p. 454]. Estimating the requisite quantity of spores for field disinfection at 8 kg. per hect., E. Metschnikoff actually produced, in his laboratory in Russia in 1884, the relatively immense amount of 55 kg. of pure spores, which proved useless, however, when tested under natural conditions in the field.

SKUDERNA (A. W.), CORMANY (C. E.), & HURST (L. A.). **Effects of time of planting and of fertilizer mixtures on the curly-top resistant Sugar-Beet variety U.S. No. 1 in Idaho.**—*U.S. Dept. of Agric. Circ.* 273, 16 pp., 1 fig., 7 diags., 1932.

The results [which are shown in the form of tables] of experiments in 1931 on the experimental farm near Castleford, Idaho, showed that on unfertilized plots the curly top-resistant U.S. No. 1 variety of sugar beet [*R.A.M.*, xiii, p. 4] sown at an early date (6th April) significantly outyielded later sowings (28th April and 8th May), both in tons of beets and in pounds of sugar per acre. In a further series of tests, the indications were that a fertilizer mixture, in which the percentage of phosphoric acid is high, is likely to give consistently good results in yield of beets and sugar with this variety, especially under cropping and soil conditions necessitating the use of commercial fertilizers. The addition to the mixture of more than 8 per cent. nitrogen resulted, with this variety, in a sharp decrease in the stand of beets.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, April–June, 1933. Quarantine and other official announcements. —pp. 185–193, 1933.

ITALY. An Order of 20th December, 1932, effective as from 1st March, 1933, prohibits the importation into, and transit through, Italy of cactus plants and fruits of whatsoever origin owing to the risk of introducing insects, fungi, or bacteria injurious to the prickly pear (*Opuntia ficus-indica*).

GERMANY. A summary is given of the plant quarantine restrictions obtaining in the Republic. [The genus *Pinus* should have been added to the list, given in this *Review*, of prohibited conifer genera under Decree of 3rd June, 1930: *R.A.M.*, ix, p. 816].

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ESAU (KATHERINE). **Pathologic changes in the anatomy of leaves of the Sugar Beet, Beta vulgaris, affected by the curly-top disease.**—*Phytopath.*, xxiii, 9, pp. 679–712, 10 figs., 1933.

A comprehensive account is given of the writer's studies at the California College of Agriculture on the anatomical changes induced in sugar beets by curly top [*R.A.M.*, xii, p. 748]. The modifications observed included hypertrophy, hyperplasia, hypoplasia, and necrosis, the last-named being limited to the phloem and pericycle and being found in the leaves, stems, and roots. Leaves developing after infection are usually stunted and show other symptoms of curly top, root growth is retarded, and numerous laterals are produced.

Probably the degeneration first observed in the phloem and pericycle is the primary effect of the disease, resulting from the actual presence of the insect-borne virus in the tissues, whereas the subsequent hypertrophy and hyperplasia in the phloem and mesophyll and the general stunting of the plant may be interpreted as secondary consequences associated with nutritional disturbances. The first stage of phloem alteration appears to be hypertrophy or division of the cells, some of which then collapse, leading in the older leaves to the formation of conspicuous cavities, surrounded by a thin-walled, callus-like tissue. The stimulation to growth and cell division in the vicinity of the necrotic lesions are reminiscent of wound-healing reactions; in such proliferations the phloem parenchyma, starch sheath, and cortical parenchyma participate. In heavily infected sugar beet leaves secondary xylem elements frequently appear in the hyperplastic callus-like tissue occupying the position of the degenerated bundle cap (pericycle). Even in healthy beets there is normally a formation of secondary and tertiary cambiums in the phloem and pericycle of the roots and flowering stalks and to a more limited extent in the leaves, these cambiums cutting off xylem and phloem just as the primary cambium does. In the diseased plants, however, the new xylem may appear without any cambium, or a few cells may show an irregular cambium formation first, and the abnormally formed xylem derived from this is without fibres, having merely radial rows of spiral, scalariform, or reticulate vessels. No connexion could be traced in transverse and longitudinal sections of diseased leaves between the normal xylem and that developed in the hyperplastic tissue. The cells of the new tissue contain only a few

small, pale, irregularly shaped chloroplasts, a degenerative change to which the 'clearing' of the veins may be attributed. In the later stages of curly top the hypertrophy and hyperplasia of the cortical tissue lead to thickening and distortion of the veins and to a formation of protuberances [ibid., viii, p. 694], while the hypertrophy of the mesophyll more distant from the phloem may cause thickening of the leaves.

A three-page bibliography is appended.

DRAKE (C. J.), TATE (H. D.), & HARRIS (H. M.). **The relationship of aphids to the transmission of yellow dwarf of Onions.**—*Journ. Econ. Entom.*, xxvi, 4, pp. 841–846, 1 graph, 1933.

The infective principle of yellow dwarf of onions [*R.A.M.*, xi, p. 760] was found, in the writers' experiments in Iowa, to be taken up by the aphid vectors (over 50 distinct species of which have proved capable of transmitting the disease) during their first feeding on diseased plants, from which it is immediately transmissible to healthy ones. On the third or fourth day after inoculation by viruliferous aphids, the growing onion becomes a source of infection and harbours the virus throughout life, though the symptoms of the disease may be masked. The infective principle, once established, becomes systemic in the plant and may persist for long periods in the dormant bulb, which appears to be the only source of overwintering of the virus. In the insect, on the other hand, the virus quickly loses its infectious character.

In 1932 *Macrosiphum pisi* was the first aphid observed feeding on onions in the Pleasant Valley (10th May); three days later the average population of this species in fields bordering lucerne was 2,500 per acre. On and after the 20th the bean aphid (*Aphis rumicis*) was common, accompanied by *A. helianthi*, *Hyalopterus atriplicis*, and other species. During the latter part of July, both in 1931 and 1932, the melon aphid (*A. gossypii*) was the most prevalent species in many onion fields, while after harvest the apple grain aphid (*Rhopalosiphum prunifoliae*) predominated and was largely responsible for the spread of the disease among volunteer onions in the autumn.

A list is given of the species of aphids which were shown to be able to act as vectors of yellow dwarf in field and greenhouse experiments, including (besides those already mentioned) *Amphorophora rubi*, *Aphis laburni*, *A. pomi*, *Brevicoryne brassicae*, *M. gei*, *Myzus cerasi*, and *M. persicae*. No transmission was effected by insects that gnaw the leaves.

WALKER (M. N.). **Occurrence of Watermelon mosaic.**—*Phytopath.*, xxiii, 9, pp. 741–744, 2 figs., 1933.

In April, 1932, Tom Watson watermelon plants in Polk County, Florida, were observed to show conspicuous symptoms of mosaic, including stunting, crowding, and mottling of the leaves, sometimes accompanied by severe malformations, various abnormalities of the floral parts, and mottling and distortion of the fruits. In extreme cases the latter failed to develop, owing to the necrosis and shedding of the blossoms before maturity. The affected plants presented a general 'petunia-like' appearance, due to the protrusion

of the runner tips and proliferation of the shoots round the crowns above the general level of the vines. Subsequent observations showed that the disease spread from the first-infected plants, but the agent of transmission has not been determined. *Aphis gossypii* was unusually abundant at the time of the infection and may be a vector.

This is apparently the first record of the spontaneous occurrence of mosaic on watermelons, though they and certain watermelon-citron crosses have been artificially inoculated with cucumber mosaic [*R.A.M.*, xi, p. 558].

CIFERRI (R.). **Le malattie della Manioca (Manihot esculenta Crantz) in San Domingo. I. Notizie sull' ambiente in cui si effettuarono gli studi. II. La malattia delle macchie fogliari circolari (Helminthosporium hispaniolae Cif.).** [The diseases of Cassava (*Manihot esculenta* Crantz) in San Domingo. I. Notes on the environmental conditions in which the investigations were conducted. II. The circular leaf spot disease (*Helminthosporium hispaniolae* Cif.).]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 2, pp. 227–240, 4 pl., 1 graph; pp. 241–308, 7 pl., 5 figs., 6 graphs, 1933. [English summaries.]

After briefly reviewing the environmental factors influencing the cultivation of cassava (*Manihot esculenta*) [*M. utilissima*] in the Dominican Republic the author gives a full account of a leaf spot (followed under certain conditions by rapid defoliation, from which, however, the plants speedily recover) of this host first observed locally in January, 1930; since then, the disease, which is not of primary importance economically, has spread and become endemic, rare in dry weather but widely prevalent in wet. Varieties with violet or brownish colouring in the young leaves are somewhat resistant.

The affected leaves show faint greenish, later brown, circular, isolated or sub-confluent spots surrounded by a delicate, dark brown halo and measuring 1 to 8 (usually 4) mm. in diameter. The spots bear blackish, erumpent, pulvinate tufts of short, thickly aggregated, sub-hyaline to light grey, continuous or 1-septate conidiophores, each of which bears one acrogenous, sub-hyaline to smoky-grey, elongated-cylindrical to ellipsoidal, straight or slightly curved, 1- to 8-, usually 3-, septate conidium with a flat base and a pointed apex, measuring 14 to 41·8 (usually 33·3) by 7·4 to 14·8 (usually 11·1) μ.

The fungus (the pathogenicity of which was established) is named *Helminthosporium hispaniolae* Cif. n. sp. It resembles an *Exosporium* in its characters on the leaf, but is not to be distinguished from *Helminthosporium* in cultural characters [full details of which are given]. The optimum temperature for infection was found to be 42° C., but rainfall is the most important factor in determining the size of the spots.

MAHOUX (J.). **Le sulfatage avec bouteilles d'air comprimé.** [Spraying with cylinders of compressed air.]—*Prog. Agric. et Vitic.*, xcix, 22, pp. 519–522, 1933.

The author states that considerable progress has been achieved

in south-west France in developing the method, introduced there in 1929, of spraying the vines with the help of compressed air which is delivered by regional agricultural co-operative societies to the growers in 8·33 l. cylinders under a pressure of 150 atmospheres, at a cost of 1·25 to 3·75 francs per cylinder. In practice this method, which involves some slight modifications to the sprayers in general use, has proved to be very successful, inasmuch as it ensures a regularity in the distribution of the spray liquid difficult to attain in hand-worked or traction air-compressing apparatus, considerably reduces the time required for the refilling of the sprayers, and increases the rapidity of the work. A further improvement has been realized by a manufacturer in Nîmes, who devised a sprayer carried on horseback, in which the residual pressure remaining in the apparatus after spraying is used to refill it with a minimum expenditure of time and without the help of auxiliary filling pumps. This apparatus, known under the name 'Compound', is of a capacity of 100 l., and was shown in practice to be able to spray 5 hect. of vines in a day, at the rate of 1,000 l. spray liquid per hect., thus ensuring the drenching of the vines with the spray liquid recommended by Ravaz for the control of downy mildew [*Plasmopara viticola*]. Under local conditions the installation cost of the air-compressing outfit is stated to be comparatively inexpensive—a first outlay of 13,000 to 18,000 francs being considered sufficient for the installation of a plant capable of serving an area of some 500 hect. of vineyards.

RAVAZ (L.). **Chronique. Au vignoble. Le black-rot.** [Current events. In the vineyard. Black rot.]—*Prog. Agric. et Vitic.*, c, 29, pp. 53–55, 1933.

A fairly severe outbreak of black rot [*Guignardia bidwellii*] on the leaves of the vine in central France, which occurred late in the spring of 1933 following frequent slight rains with high day temperatures, gives occasion to the author to recommend the drenching of the developing grape bunches with a wetting cupric spray, since these organs are those that suffer most from the attacks of the fungus. The disease does very little injury to the vine leaves and wood.

RAVAZ (L.). **Chronique. L'anthracnose sur producteurs directs.** [Current events. Anthracnose on ungrafted Vines.]—*Prog. Agric. et Vitic.*, xcix, 26, pp. 613–615, 1933.

The author points out that the practical suppression of vine anthracnose [*Gloeosporium ampelophagum*: *R.A.M.*, xii, p. 6] in France has been chiefly brought about by the systematic spraying of the vineyards with Bordeaux mixture against mildew [*Plasmopara viticola*], since both diseases are amenable to control by this preparation. In wet years, however, American varieties of the vine and certain American hybrids which are cultivated without grafting are fairly severely attacked by anthracnose, this being ascribed to the fact that they are not sprayed owing to their high resistance to, or immunity from, mildew. It is recommended, therefore, that vines liable to severe anthracnose injury should be

included in the general spraying schedule with Bordeaux mixture, and that the stocks should be sprayed in the winter, a few days after pruning, with a 35 per cent. iron sulphate solution, to which 1 l. sulphuric acid [per 100 l. solution] is added.

CIFERRI (R.). **La 'necrosi' degli acini d'Uva.** [Necrosis of Grape berries.]—*Giorn. di Agric. della Domenica*, xliii, 37, p. 358, 3 figs., 1933.

Vines in France and Italy are liable to a condition, the cause of which remains obscure, which produces a necrosis of the berries hitherto probably confused with attack by *Oidium* [*Uncinula necator*]. A few half-developed berries on a few bunches are attacked simultaneously, while the very small and the ripe berries remain unaffected.

The first symptom is the appearance of a livid, indefinitely shaped spot on the side of the berry; at this point the tissues collapse and the surface becomes flattened, as if pressed with the thumb, this characteristic accounting for the French name for the condition, 'coup de pouce'. After a few days, the spot turns brown, and the depression of the surface becomes marked. The bunch may wilt as a whole and longitudinal cracks appear in the fruit, laying the seeds bare.

It is generally agreed that the condition is due to physiological causes associated with weather conditions (especially dry, windy summers) or internal functional disturbances. Affected but unbroken berries show no sign of fungal attack.

In the author's opinion, the condition, which requires further investigation, is a form of sunstroke due to a number of factors varying in their manifestations and importance but all associated with weather conditions.

Rapport sur le fonctionnement de l'Institut des Recherches Agronomiques pendant l'année 1932.—489 pp., 6 graphs, 1933.

In 1932, warnings against impending attacks of vine diseases [chiefly *Plasmopara viticola*, *Uncinula necator*, and *Guignardia bidwellii*] were issued by the Bordeaux climatological station to 1,236 subscribers, as compared with 1,202 in 1930 and 1,425 in 1931. At Clermond-Ferrand similar warnings against vine downy mildew [*P. viticola*] and *Oidium* [*U. necator*], potato late blight [*Phytophthora infestans*], and apple diseases [chiefly *Venturia inaequalis*] were issued to 525 subscribers, as against only 225 in 1931.

Between the beginning of April and the end of August, 1932, nineteen waves of attack by *P. viticola* occurred on the vines in the south of France, this record figure being largely due to heavy, frequent rains in spring. On each occasion infection became widespread one week after the initial attack. The part played by dew, mists, and nocturnal rain in favouring infection is briefly discussed, and a simple technique for predicting the date of a first attack, based on a method for observing the germination of the oospores in the spring, under as natural conditions as possible, is

described. However, in a paper read by Moreau and Vinet at Angers in June, 1932, before the directors of the French oenological stations, they stated that twenty years' observations in one local vineyard had shown the development of *P. viticola* to be so dependent on transient conditions that accurately to predict an outbreak any length of time beforehand is practically impossible; as a precautionary measure against infection of the bunches the authors always give two copious applications (with an interval of ten days and at a time when the berries can be easily reached) of a cupric lead arsenate mixture whatever the prevailing weather during the previous and current year.

Notes are also given on diseases of wheat [*R.A.M.*, xii, pp. 490, 682], potato, tobacco, hops, fruit trees, walnut, chestnut, and market-garden crops [ibid., xii, pp. 489, 491; xiii, p. 76], and numerous French, German, English, American, Dutch, and Polish potato varieties found after three years' trials to be resistant to *Synchytrium endobioticum* are listed.

The elm disease due to *Graphium* [*Ceratostomella*] *ulmi* [ibid., xiii, p. 64] is now widely distributed in France; the fungus was isolated from elms bordering roads in Alsace, where the disease is stated to have been present in 1920.

In a test of varietal resistance to poplar canker [ibid., xii, p. 127] the variety of poplar grown in the valley of the Ourcq showed the fewest lesions, whereas *Populus generosa* developed a rapid and serious attack on the trunk.

POLLACCI (G.). **Rassegna sull'attività del Laboratorio Crittogamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1932.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia and Piacenza) during the year 1932.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 3–23, 1933.

This account of the work done at the Cryptogamic Laboratory, Pavia, in 1932 [cf. *R.A.M.*, xii, p. 200] includes a number of items of phytopathological interest, of which the following may be cited. Very severe damage was caused to fruit trees, especially apricots, plums, and (to a less extent) peaches by tracheomycosis [*Verticillium* sp.: ibid., x, p. 150]. Varieties recently introduced suffered most, the only apricot variety remaining unaffected in lower Lombardy, for example, being the old local one.

Die-back of elms (*Graphium* [*Ceratostomella*] *ulmi*) is becoming more and more widespread in Italy [ibid., xii, p. 734], especially in the vicinity of Piacenza and Parma, where many thousands of trees have died. In the attempt to discover a resistant variety hundreds of *Ulmus pumila* trees have been distributed to growers; after being inoculated with *C. ulmi* young *U. pumila* trees grew well, infection being limited in extent.

The canker of Canadian poplar [*Populus canadensis*] caused by *Dothichiza populea* [ibid., xi, p. 338] is present, but does not cause much damage, in the vicinity of Pavia.

The paper concludes with a 12-page list of the plant diseases

identified during the year, the hosts being arranged in groups and the causal organism of the parasitic diseases indicated in each case.

Plantesygdommer i Danmark 1932. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1932. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. for Planteavl*, xxxix, 3, pp. 453–506, 3 figs., 2 graphs, 1933. [English summary.]

This report, compiled by E. Gram and his collaborators on the usual lines [*R.A.M.*, xi, p. 767], contains a list showing the number of inquiries received concerning each disease, arranged under the different crops. The following are new records for Denmark. Mosaic diseases were observed on different varieties of outdoor primulas at Lyngby, and were reported from various places on swedes, elder (*Sambucus*) [*nigra*], *Callistephus*, chrysanthemum, peony, and phlox.

Beans [*Phaseolus vulgaris*] in the Copenhagen district were attacked by both *Phytomonas viridiflava* var. *concentrica* and *P.* [*Bacterium*] *medicaginis* var. *phaseolicola* [ibid., xii, p. 348].

Phoma roseola was found on poorly germinating seedlings of snail's medick [*Medicago scutellata*], the germination of which was improved by dusting the seed with sanagran T or one hour's immersion in 0·25 per cent. uspulun.

Forty-sixth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1932–33.—24 pp., 1933.

The following items of phytopathological interest occur in this report, which covers the period from 1st July, 1932, to 30th June, 1933. On the Experiment Station plots, all of which are thoroughly infested by the lucerne wilt organism, *Aplanobacter insidiosum* [*R.A.M.*, xii, p. 615], all the reputedly resistant varieties of whatever origin [ibid., xii, p. 336] were killed in susceptibility trials. Of those grown in adjacent counties on selected farms, Ladak was shown to be the most resistant. The sole practice enabling the stand to be carried on was that of omitting the third cutting, which resulted in an annual reduction of yield amounting to about 0·75 ton, but saved the crops where other measures failed to do so.

Extensive field and greenhouse studies are considered to lend no support to the virus theory of the etiology of psyllid yellows of potatoes [ibid., xiii, p. 119]. Investigations were further carried out on the control of purple blotch of onions [ibid., x, p. 87] by spraying, and on a *Fusarium* neck rot of stored onions, collar rot of tomatoes (*Alternaria solani*) [ibid., xiii, p. 65, and below, p. 195], and carnation wilt (*F. dianthi*) [ibid., xiii, p. 31].

GHEORGHIU (I.). **Le cancer des plantes et l'immunité anticancéreuse.** [Plant cancer and anticancerous immunity.]—*Ann. Inst. Pasteur*, li, 4, pp. 535–544, 1 col. pl., 4 figs., 1933.

The essential information in this extended account of the writer's studies on the immunization of *Pelargonium zonale* against crown gall (*Bacterium tumefaciens*) in Rumania has already been noticed from another source [*R.A.M.*, xii, p. 496].

CHESTER (K. S.). **Studies on bacteriophage in relation to phytopathogenic bacteria.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 1–4, pp. 1–30, 1933.

A comprehensive, tabulated account is given of the writer's studies on the bacteriophage phenomenon in relation to crown gall (*Bacterium tumefaciens*) of *Pelargonium zonale* [*R.A.M.*, xiii, p. 16] and beet [ibid., x, pp. 285, 779]. A critical examination of the technique of bacteriophage investigation in connexion with phytopathogenic bacteria led to the development of a satisfactory standard procedure [full details of which are given].

In 60 tests on *P. zonale* stems bacteriophage was isolated from 40 per cent. of the crown galls produced by inoculation with a strain already containing a weak bacteriophage, from 30 per cent. of the adjacent healthy tissues, and from none of the sound, non-infected plants. In corresponding experiments with beetroot, bacteriophage was isolated from 75 per cent. of the galls, from 40 per cent. of the surrounding tissues, and from 30 per cent. of the non-infected plants. The *Pelargonium* tests show that the bacteriophage is able to diffuse outwards from the site of infection into the surrounding healthy tissues, while those with beet afford additional evidence that bacteriophage from the soil can penetrate the healthy root tissues. Although the distance thus traversed by the bacteriophage was only a few centimetres at the most, the possibility of explaining, by its prophylactic value in healthy plant tissues, such results as those reported by Arnaudi in the vaccination of plants against crown gall [ibid., viii, p. 116], must be taken into account.

SĂVULESCU (T.). **Beiträge zur Kenntnis der Biologie der Puccinia-Arten, die den Weizen in Rumänien befallen.** [Contributions to the knowledge of the biology of the *Puccinia* species attacking Wheat in Rumania.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 10, pp. 577–594, 1 graph, 3 maps, 1933.

Both as regards overwintering and their modes of dispersal and infection, the three species of *Puccinia* attacking wheat in Rumania [*R.A.M.*, xii, p. 549] present divergent features. *P. triticina* overwinters in the form of uredospores and resting mycelium arising from autumn infections, and after a relatively mild winter spread of the infection takes place early in the season (April to May) [cf. ibid., xiii, p. 82]. Following very severe winters, however, or in the absence of autumn infections, fresh outbreaks of rust are not observed before June, when they must be attributed to reinfection by uredospores conveyed from a distance by easterly and southerly winds.

P. glumarum [ibid., xiii, p. 18] cannot overwinter in Rumania in the form of uredospores and resting mycelium, so that outbreaks of yellow rust do not usually occur before June, when a fresh contingent of uredospores is borne into the country chiefly by winds from the north and west.

P. graminis never overwinters in Rumania except by teleutospores which infect the numerous barberries in the spring and thence pass to wheat by the end of June or early July at the latest.

There is no connexion, however, between certain sudden epidemics of black rust which have been observed without infection of an alternate host in the spring, and the previous year's attacks, and the former are considered to be, in all probability, the result of new infections by foreign uredo- or aecidiospores carried mainly by the south wind.

Inoculation experiments with the basidiospores of *P. triticina* on nine species of *Thalictrum* gave positive results only on *T. flavum*, *T. aquilegifolium*, *T. bauhini*, and *T. minus*. In no case, however, has spontaneous infection by the aecidial stage of *P. triticina* been observed in Rumania on any species of *Thalictrum*.

FARIS (J. A.), TAPKE (V. F.), & RODENHISER (H. A.). **Wheat smuts and their control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1711, 16 pp., 10 figs., 1 graph, 1933.

A popular account (superseding *Farmers' Bull.* 1540) is given of the symptoms, etiology, distribution, and control of the wheat smuts caused by *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*], *Ustilago tritici*, and *Urocystis tritici*.

BLUNCK [H.]. **Die Umstellung im Getreidebau und die Pflanzenkrankheiten. 1. Verarmen der Fruchtfolge und seine Gefahren. 2. Die Fusskrankheiten des Getreides. 3. Getreidemehltau, Gelbrost, Fritfliege und Weizengallmücken.** [The reorganization of cereal cultivation and plant diseases. 1. Diminution of rotation and its dangers. 2. The foot rots of cereals. 3. Cereal mildew, yellow rust, frit fly and Wheat gall midges.]—*Mitt. Deutsch. Landw. Gesellsch.*, xlviii, 13, pp. 262–263; 14, pp. 286–288; 18, pp. 377–378, 6 figs., 3 graphs, 1933.

Attention is drawn to some potential dangers (already becoming apparent in certain quarters) of the campaign for an extension of cereal cultivation in Germany, where the comparatively hardy rye and oat crops, moreover, are being largely replaced by wheat and barley which are far more exacting in their requirements. Inadequate rotation is tending to increase the cereal foot rots of wheat caused by (*Ophiobolus*) [*graminis* and *O. herpotrichus*], *Cercosporella herpotrichoides*, and *Fusarium* spp. [*R.A.M.*, xii, pp. 502, 685; xiii, p. 23, *et passim*], as well as various other diseases. It is estimated that since 1929 the total area under cereals has increased by some 137,000 hect., while in some districts of Schleswig-Holstein in 1933 cereals occupied 75 to 90 per cent. of the land. This had led to overproduction and a serious fall in prices, necessitating considerable economic adjustment.

MORITZ (O.) & BOCKMANN (H.). **Einleitende Studien über Cercosporella herpotrichoides Fron.** [Introductory studies on *Cercosporella herpotrichoides* Fron.]—*Angew. Bot.*, xv, 5, pp. 409–419, 1 fig., 1 graph, 1933.

Cercosporella herpotrichoides, first reported from Germany in 1932 [*R.A.M.*, xii, p. 502], was found to be a fairly regular con-

comitant of lodging on wheat plants in Schleswig-Holstein [see preceding abstract], Saxony, and Pomerania. Inoculation experiments demonstrated the pathogenicity of the fungus to wheat seedlings. The symptoms induced by mixed inoculations with *C. herpotrichoides* and *Fusarium culmorum* were more severe than those obtained with either organism alone. In nature *C. herpotrichoides* was sometimes found accompanied by *Ophiobolus graminis*, *Wojnowicia graminis*, and a number of other organisms [which are listed], but *Leptosphaeria herpotrichoides* was never observed. Conidial formation was most profuse in cultures exposed to fluctuating temperatures (below 0° to 21° C.) and in those with a poor supply of nutriment, e.g., soil agar.

HEMPELMANN & STEININGER. **Beobachtungen über Fusskrankheit an Weizen.** [Observations on foot rot of Wheat.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 36, pp. 783–785, 1933.

The writers' observations on the cultural and rotational practices in a number of outbreaks of foot rot of wheat (primarily the black basal form) [associated with *Ophiobolus graminis*: *R.A.M.*, xi, p. 444; xii, p. 19, and preceding abstracts] in Hanover are summarized, tabulated, and discussed. Of all the measures tending to maintain the soil in a healthy condition, crop rotation is the most important. Barley should be absolutely excluded, as wheat suffers more from root rot after this than after any other crop, rye being also detrimental though to a lesser degree. Oats do not definitely predispose the wheat crop to foot rot but are not suitable for rotation with wheat if either barley or rye also occurs in the rotation. Wheat should not be allowed immediately to precede wheat. The incidence of foot rot appears to be increased by the use of fresh stable manure. In certain cases in which the disease developed even where beets or potatoes were grown between barley and wheat, unsuitable soil conditions are considered to have promoted infection.

BENNETT (F. T.). **Gibberella saubinetii (Mont.) Sacc. on British cereals. III. Occurrence under natural conditions.**—*Ann. of Appl. Biol.*, xx, 3, pp. 377–380, 1 graph, 1933.

In 1932, the author observed the perithecial stage of *Gibberella saubinetii* on the ears of Little Joss wheat in Northumberland, this being the first record of the occurrence of this stage under natural conditions in England [*R.A.M.*, x, p. 783]. In 1929, although the summer rainfall and its distribution over the season were approximately the same as in 1932, the perithecia of *G. saubinetii* did not develop outdoors on artificially inoculated wheat and barley, from which the author concludes that the determining factor in their production and maturation in the latter year was the higher mean temperature and occasional very hot days that prevailed.

Single ascospore cultures normally gave only a *Fusarium* growth; the ascigerous type of growth arose only from ascospores developed under abnormal conditions.

SHANDS (R. G.), LEITH (B. D.), DICKSON (J. G.), & SHANDS (H. L.). **Stripe resistance and yield of smooth-awned Barley hybrids.** —*Wisconsin Agric. Exper. Stat. Res. Bull.* 116, 22 pp., 2 figs., 3 graphs, 1 map, 1933.

A detailed study [the results of which are fully discussed and tabulated] showed a wide variation in reaction to stripe disease (*Helminthosporium gramineum*) among the economically important selections from a cross between the rough-awned Pedigree Oderbrucker barley (*Hordeum vulgare* var. *pallidum typica*) and a small, black, smooth-awned type (var. *nigrum leiorrhynchum*). Amongst the progeny, several of a group termed X 39 were distributed as pedigree lines. One of these, termed Wisconsin Pedigree 38 or Wisconsin Barbless, has consistently proved superior in yield and stripe resistance to the Oderbrucker which was previously the standard variety in Wisconsin, and is now reported to have almost displaced other barley varieties in the State. The selections were tested for stripe resistance in a number of different localities, chosen because of the prevalence of the disease in them. When any of the X 39 and X 57 selections were crossed back to the Oderbrucker parents, the susceptibility to stripe was augmented. Selections from such back-crosses closely approximated to the Oderbrucker type in appearance and ranged in stripe reaction from moderate resistance to susceptibility almost equal to that of the susceptible parents. The stripe reaction appears to be correlated with environment during the flowering and seedling stages of the host, and this relationship, which is complex, requires extended study. A given line fluctuates widely in stripe infection and development under different external conditions, while conversely, the same environment seems to act dissimilarly on the occurrence of stripe in the various selections.

PETERSEN (E. J.). **Havrebakterioser, foraarsaget af Phytomonas coronafaciens.** [Oat bacterioses caused by *Phytomonas coronafaciens*.]—*Tidsskr. for Planteavl*, xxxix, 3, pp. 507–523, 2 pl., 1933.

Oat leaves of the Borris Stand variety submitted to the State Experiment Station at Studsgaard for examination in the summer of 1932, were found to bear oval, greyish, or brownish spots, 1 to 2 mm. in diameter, surrounded by a characteristic green to yellow halo, edged in the more pronounced lesions by a darker brown or purplish ring. In cases of very severe infection the dark outer circles of the halo impart a brownish aspect to the leaf, while the paler central portions often expand and unite to form elongated stripes or irregular islets in which the original points of infection are marked by a darker colour. Leaves thus affected show a general tendency to wilt, often accompanied by curling of the tips.

In the parenchyma cells of the diseased areas rod-shaped, flagellate bacteria, 1·2 to 3·4 μ in length (average 2·2 by 0·6 μ), were found. The organism is Gram-negative, non-acid-fast, liquefying gelatine and peptonizing milk; forming flat, grey colonies on various nutrient media, with minimum, optimum, and maximum temperatures for growth on Difco meat-peptone-bouillon and 1 per cent. dextrose agar at under 6°, 25°, and about 40° C., respectively,

thermal death point 45°; strictly aerobic; developing at a hydrogen-ion range of P_H 5·8 to 8·2, optimum P_H 6·3 to 6·9; making good growth in Fermi's solution with distinct fluorescence, but none in Uschinsky's; utilizing dextrose, levulose, saccharose, maltose, lactose, and mannite, with acid formation on the first three; not reducing nitrates or forming diastase or indol. The index number of the organism (American Society of Bacteriologists) is 5020–31101–0202.

The taxonomy of the pathogen is discussed in relation to the previously reported agents of oat bacteriosis, viz., *Pseudomonas avenae*, *Bacillus avenae* [*R.A.M.*, x, p. 10], *Bacterium coronafaciens* [ibid., vi, p. 272; vii, p. 562; viii, p. 359], and *Bact. striafaciens* (*Journ. Agric. Res.*, xxxv, p. 811, 1927), and the conclusion reached that it corresponds with the causal organism of halo blight, *Bact. coronafaciens*. 'Spot bacteriosis of oats' is the suggested common name for the disease.

After a year in pure culture the pathogen underwent no loss of virulence. Inoculation experiments on eight other varieties of oats besides Borris Stand gave little or no indication of differences in susceptibility. The first spots appeared four to eight days after inoculation and within two to four weeks the leaves assumed a uniform pallor and finally wilted. Under field conditions, however, Borris Stand seems to be the only susceptible variety. The organism was readily conveyed from one part to another by the daily watering, and there was also evidence that it can be transferred from one plant to another by contact.

Apparently the only other record of *Bact. coronafaciens* in Europe is that furnished by Miss Sampson and D. W. Davies from Wales [*R.A.M.*, ii, p. 401; xi, p. 295].

STANTON (T. R.) & MURPHY (H. C.). **Oat varieties highly resistant to crown rust and their probable agronomic value.**—*Journ. Amer. Soc. Agron.*, xxv, 10, pp. 674–683, 1933.

The writers report and tabulate the available information on the origin, introduction, nomenclature, and probable agronomic value of some new varieties of oats with a high degree of resistance to crown rust (*Puccinia coronata avenae*) [*P. lolii*].

Bond (C. I. 2733), an Australian hybrid between the Algerian *A. sterilis* and Golden Rain with the characters of *Avena byzantina*, was found to be outstanding both as regards resistance to crown rust and desirable agricultural features. Kareela (C. I. 2774), an Australian selection from Fulghum of similar type to the foregoing, proved highly resistant in the natural epiphytotics of 1931 in Iowa and Kansas, and in the former State in 1932, but showed complete susceptibility to the rust in Georgia in 1932. The two Victoria strains (C. I. 2401 and 2764) gave marked evidence of resistance to 32 physiologic forms of *P. lolii* collected in the United States, Canada, and Mexico from 1927 to 1931, inclusive [*R.A.M.*, ix, p. 771]. Other new varieties of considerable promise are Capa (C. I. 2765 and 2860), Pampa (C. I. 2767), Alber (C. I. 2776), Criolla (C. I. 2862), Red Algerian (C. I. 2861 and 2867), and Berger (C. I. 2926).

In 1932 Bond produced good yields at five stations; Kareela has

given satisfactory results only from spring sowings, while Alber equalled the yields of the best Red Rustproof strains in autumn sowings in south Georgia in 1931–2. Generally speaking, the Victoria and Capa strains are low yielders, and altogether the chief value of the rust-resistant varieties will probably be for hybridization purposes.

YOUNG (V. H.) & MCCLELLAND (C. K.). **Control of Oat smut.**—*Phytopath.*, xxiii, 10, pp. 825–830, 1933.

Complete control of loose and covered smuts of oats [*Ustilago avenae* and *U. kolleri*] was secured both in 1931 and 1932 in Arkansas by Du Bay dust 952 C (active principle 1 per cent. ethyl mercury tartrate), ceresan, and corona oat dust [*R.A.M.*, xi, p. 634]. Good results were also given in both years by Du Bay 500 LL (1 per cent. ethyl mercury arsenate) and in the second by Du Bay 1134 (2·5 per cent. ethyl mercury phosphate) at the rate of 1 oz. per bushel. The results of treatment with 10 per cent. solution of iodine in carbon bisulphide (½ oz. per bushel) were much less satisfactory in 1932 than in the previous year [ibid., xii, p. 12].

RAINIO (A. J.). **Punahome Fusarium roseum Link—Gibberella saubinetii (Mont.) Sacc. ja sen Aiheuttamat myrkytykset kaurassa.** [*Fusarium roseum* Link—*Gibberella saubinetii* (Mont.) Sacc. on Oats and the poisoning induced thereby.]—*Valtion Maatolouskoetoiminnan Julkaisuja* 50, 45 pp., 6 figs., 1 map, 1932. [Finnish, with German summary. Received January, 1934.]

In the winter of 1931 the writer examined samples of oats that had either been rejected by stock or caused digestive disturbances. Similar cases are stated to have occurred in various parts of Finland since 1924. Among the fungi detected on the material was *Fusarium roseum*, cultures from the conidia or mycelium of which on oatmeal agar, potato plugs, or oat grains developed the typical sporodochia, perithecia, asci, and ascospores of *Gibberella saubinetii* [*R.A.M.*, x, p. 651, and above, p. 154]. The cultural characters of the fungus also fully agreed with those of *G. saubinetii*.

The quantitative determination of the amount of infection present in a given sample was found to be much more reliable when based on germination tests than when calculated from the number of conidia found in washings from the grain or from the number of visibly attacked grains. The germination tests were made on damp sand in the dark at a temperature of 10° to 12° C. The fungus occurs on some of the grains exclusively in the mycelial form, barely distinguishable on dry material.

Oats infected by *G. saubinetii* were rejected by horses, or eaten reluctantly with consequent digestive disorders, when the infection exceeded 20 per cent. of the grains; between 10 and 20 per cent. the food was unpalatable, but below 10 per cent. no ill effects were observed. Cattle showed no loss of appetite unless the infection exceeded 20 per cent., while pigs reacted in different ways, mostly rejecting the oats, however, or taking them unwillingly when over 20 per cent. of infection was present. It was experimentally shown that the daily increase over a 77-day period in the weight of pigs

fed on grain with over 20 per cent. infection was only 520 gm. compared with 560 gm. for those receiving healthy grain.

Contrary to expectation, the weight of diseased oat grains was not necessarily reduced or their germinative capacity impaired.

Transverse sections through heavily infected grains revealed the presence of hyphae in most of the pericarp cells, and penetrating the testa to reach the albumin layer. In very severe cases the cells even of the embryo were found to contain hyphae.

Germination and field tests showed that infection of oat seedlings by *G. saubinetii* takes place either from the seed or through the soil. It was ascertained that infection from both these sources may be successfully combated by seed-grain treatment with various fungicides, including germisan 225, uspulun, and jyväs. Early sowing is recommended, as it has been found that high temperatures at the time of emergence favour the development of the fungus. Close, damp weather during harvesting and storage in musty boxes also promote infection. Some correlation appears to exist between the colour of the oat husks and reaction to *G. saubinetii*, the white varieties, such as Goldregen, Yellow Canada, and Siegfried being more susceptible than the black or brown ones, e.g., Glocken [Bell] and Orion II. In addition to the seed treatment the writer recommends thorough drainage and good tillage; the substitution of lime and phosphates for animal manure; and the removal after harvest of all stubble from fields to be put under grass or root crops in the following season.

[O'Brien (D. G.) & Dennis (R. W. G.).] **Helminthosporium disease of Oats.**—*West of Scotland Agric. Coll. (Dept. of Plant Husbandry) Res. Bull.* 3, 74 pp., 23 pl., 7 graphs, 1 map, 1933.

A comprehensive study has been made in south-west Scotland on the leaf stripe disease of oats caused by *Helminthosporium avenae* [*R.A.M.*, xii, p. 162], the incidence of the seedling phase of which in 225 fields in seven counties averaged 30·2 per cent. Up to the present the disease has been recorded in Europe, North America, Japan, and India. A description is given of the primary and secondary symptoms of infection, followed by a detailed account of the cultural and morphological characters of the fungus. Saltation was of frequent occurrence in the strains of *H. avenae* used in the investigations, the mutants being characterized by variations in density of growth as well as in colour. Pycnidia have not been observed in the field and developed only in one culture on maize meal agar from a secondary infection on old leaves; they extruded hyaline, circular to slightly elliptical pycnospores, 2 by 2 to 3 μ, which failed to germinate either in water or on oatmeal agar at room temperature or 25° C. The small knots of compacted cells occurring at intervals along the resting mycelium on the infected glumes and paleae may be regarded as imperfect sclerotia. True sclerotia are more abundant on diseased material, especially leaves lying in the field after harvest. These organs which, like the pycnidia, are visible to the naked eye as minute, black dots, are compact, spherical or elliptical, deeply embedded in the host tissues flanking the vascular bundles, with a dark brown, papillate outer wall enclosing a colourless, thin-walled pseudo-

parenchyma full of oil globules. They may be immature stages of the perithecial form, *Pleospora avenae* [ibid., x, p. 234]. The fungus grows well between P_H 5 and 6·75, its optimum temperature being about 20° and maximum about 30° C. Prolonged exposure to temperatures below the freezing point does not injure it. Germination seems to be impossible at a relative humidity below 96 per cent.

Prior to penetration of the leaf by *H. avenae* an appressorium is produced on the germ-tubes at random, from the lower side of which an infection hypha enters the stomatal cavity or penetrates the cuticle of an epidermal cell, across which it passes to emerge into an intercellular space. Subsequent growth is entirely intercellular [cf. next abstract]. The vital importance of a high degree of atmospheric humidity for successful infection was shown by the failure of inoculation experiments with conidial suspensions on the leaves of plants under a bell jar which became completely dry within 24 hours. Under these conditions the host is enabled to develop a protective mechanism and no lesions are formed. Only in a saturated atmosphere in closed Petri dishes were leaf spots produced in these tests, infection being most intense on the parts in contact with the glass and surrounded by a persistent film of moisture. Possibly the late appearance of secondary infection in the field may be due to the more humid conditions found in the mature crop.

Microscopically the leaf lesions show three distinct zones, of which the outermost is marked by incipient disorganization of the chloroplasts, the intermediate is the region of active parasitism, while the central area is mummified and desiccated.

Of the 14 oat varieties obtained from different sources and tested for their reaction to *H. avenae* at Kilmarnock, Ayrshire, none gave any indication of outstanding resistance. The most susceptible were Sovereign and Ascot (20 and 23 per cent. infection, respectively). Details are given of the control of the disease by seed disinfection with ceresan.

SMITH (N. J. G.) & PUTTERILL (K. M.). **A disease of Eleusine and notes on invasion of phloem by Helminthosporia.**—*S. African Journ. of Sci.*, xxx, pp. 198–205, 3 figs., 1933.

Eleusine indica, a nutritious stock grass in South Africa, is liable to infection by *Helminthosporium leucostylum* [*R.A.M.*, xi, p. 426], which causes a black-dusted withering and splitting of the leaf tips, followed by a brown spotting of the lower portions due to secondary infection by wind-blown conidia.

The morphological features of the fungus agree with Drechsler's description [ibid., iii, p. 67]. The germ-tubes sometimes enter the host through the stomata or they may penetrate the cuticle by means of a narrow peg, which swells into a vesicle with dense contents, forces the cell walls apart, and elongates into a hypha between two epidermal cells. The fungus evidently secretes a substance that acts on the middle lamellae in advance of the hyphae, which gradually force their way downwards until the bundle sheath is traversed. At this stage thick hyphae may be seen in the sieve-

tube cavities, but only when the resistance of the host is completely broken down do they enter the vessels. A similar invasion of the phloem has been observed by the senior author in barley infected by *H. gramineum* [ibid., xii, p. 162], the coleoptiles of which were most severely affected in the vascular region. These facts are considered to afford a more plausible explanation of the destructive character of barley leaf stripe than the theory of a purely intercellular life of the fungus. *H. avenae* probably invades the phloem cells of oats even more readily [see preceding abstract].

HUME (A. N.) & FRANZKE (C. J.). **The germination of seed Corn and its relation to the occurrence of molds during germination.**—*South Dakota Agric. Exper. Stat. Bull.* 275, 19 pp., 7 figs., 1933.

A preliminary survey of seed maize from 24 sources in five counties of eastern South Dakota showed that moulds, sometimes developing into destructive ear rots, are commonly present to the extent of 12·5 to 76·4 per cent., the organisms most frequently encountered being *Diplodia zeae*, *Fusarium* spp., *Gibberella saubinetii*, *Cephalosporium acremonium* [*R.A.M.*, x, pp. 180, 644], and *Rhizopus* spp. The results of five years' rag-doll germinator tests showed that the germination percentage of mouldy kernels was consistently lower than that of healthy ones.

FAWCETT (H. S.) & JENKINS (ANNA E.). **Records of Citrus canker from herbarium specimens of the genus Citrus in England and the United States.**—*Phytopath.*, xxiii, 10, pp. 820–824, 1 fig., 1933.

A tabulated account is given of the writers' examination of English and American herbarium specimens of citrus canker (*Pseudomonas citri*), from which it appears that the earliest herbarium materials of the disease are those on *Citrus medica* from north-western India (? 1827–31) and on *C. aurantifolia* from Java (1842–4).

REYDON (G. A.). **Voorloopige mededeeling over Diplodia en takkenboeboek.** [A preliminary note on *Diplodia* and branch borer.]—*De Bergcultures*, vii, 42, pp. 1172–1178, 2 figs., 1933.

A description is given of the symptoms of infection of *Hevea* rubber bud grafts and seedlings in Java by *Botryodiplodia theobromae*, and the relationship of this common trouble to sun scorch [*R.A.M.*, xi, pp. 432–433] is discussed. The same fungus was also found infecting coffee shortly after the invasion of the latter by the black branch borer (*Xyleborus morstatti*). Although the actual incidence of infection by *B. theobromae* is highest on coffee during the rainy season (correlated with favourable conditions for the ambrosia fungus supplying the borer with food) [cf. ibid., vii, p. 511], the resultant die-back of the branches is more noticeable in the succeeding dry period. At this time the oxygen requirements of the organism are more readily met by the wood tissues and the condition of the host is less vigorous. The problem of

control is briefly outlined. The paper, given at a meeting of the 'Koffie- en Rubberkring te Djember' in September, 1933, was followed by a discussion (pp. 1179–1180).

HANSFORD (C. G.), HOSKING (H. R.), STOUGHTON (R. H.), & YATES (F.). **An experiment on the incidence and spread of angular leaf-spot disease of Cotton in Uganda.**—*Ann. of Appl. Biol.*, xx, 3, pp. 404–420, 5 diags., 3 graphs, 1933.

In an experiment [a preliminary account of which has already been noticed: *R.A.M.*, xii, p. 439], conducted in 1931–2 in Uganda to investigate the incidence and spread under field conditions of angular leaf spot of cotton (*Bacterium malvacearum*), plots were sown, respectively, with untreated seed from a moderately attacked crop; with seed dusted with Dupont granosan; seed delinted for 40 mins. with concentrated sulphuric acid, washed, immersed in 1 per cent. mercuric chloride solution under a partial vacuum for 15 mins., and washed again; and seed soaked in a strong suspension of *Bact. malvacearum*.

The results [which are tabulated, plotted, and fully discussed] demonstrated that the seed treatments markedly reduced the amount of disease present. That seed dusting increases total germination was shown by the fact that the dusted seed gave more plants by the end of the season than the remainder, allowing for the plants killed by the disease. The sterilization with sulphuric acid and mercuric chloride greatly reduced the amount of infection present throughout the season. The inoculated plants had a significantly higher, and the delinted plants a significantly lower, incidence of disease than the others. Primary infection was restricted almost entirely to the inoculated seed; it appeared within a fortnight of sowing and reached its maximum about a month later. In general, there was an evident tendency for the disease to spread down the slope of the land, the main lines of surface wash after a very heavy fall of rain marking the direction in which the disease spread.

Blackarm lesions were present only on leaf-spotted plants, among which they were evenly distributed. Analysis of the stem and branch infections indicated that most of them were extensions of petiole lesions [ibid., xii, p. 422]. Petiole infections originate in the leaf, the organism passing down the cortical tissue of the leaf stalk and reaching the cortex of the stem or branch. The relatively small increase in the number of lesions on the main stems, as compared with that on the branches and short shoots arising from secondary buds, further showed that *Bact. malvacearum* can obtain a foothold only in young, immature tissues.

PETCH (T.). **Notes on entomogenous fungi.**—*Trans. Brit. Mycol. Soc.*, xviii, 1, pp. 48–75, 1933.

In continuation of his earlier papers on entomogenous fungi [*R.A.M.*, xii, p. 216] the author describes and discusses a number of species of *Cordyceps* and *Isaria*, mostly from tropical and subtropical regions, including one previously undescribed species found on Orthoptera in Ceylon and named *Isaria orthopterum* Petch n. sp., a diagnosis of which is given in English and Latin.

CASTELLANI (A.) & JACONO (L.). **Observations on fungi isolated from cases of blastomycosis cutis and blastomycosis pulmonalia in North America and Europe. Remarks on blastomycetin.**—*Journ. Trop. Med. & Hygiene*, xxxvi, 20, pp. 297–321, 56 figs., 1 col. pl., 1933.

After some preliminary clinical observations on the cases of dermal and pulmonary blastomycosis forming the basis of the present studies, the writers give morphological and cultural particulars of the following organisms, accompanied by critical notes on their taxonomy: *Geotrichum immite* [*Coccidioides immitis*: *R.A.M.*, xiii, p. 95], *G.* (*Blastomyces*) [*Endomyces*] *dermatitidis* [loc. cit.], *G. multifermentans* Cast. 1933, *G. louisianoideum* Cast. 1933, *Monosporium tulanense* [ibid., xii, p. 171], *M. venezuelense* Cast. 1933, *Glenospora lanuginosa* [loc. cit.], *G. meteuropaea* Cast. 1933, *G. metamericana* Cast. 1933, *G. brevis* Cast. 1933, *Torulopsis hominis* Vuill. var. *honduriana* Cast. 1933 (*Cryptococcus hominis* var. *hondurianus*, *C. hondurianus*), *Candida pinoysimilis* Cast. 1933, *Torulopsis* (*Monilia* or *Cryptococcus*) [ibid., viii, p. 677; xii, p. 288] *castellanii*, and *T.* (*M.* or *C.*) *macroglossiae* [ibid., v, p. 98]. A number of other fungi, capable of inducing blastomycosis but not yet isolated by the writers, are briefly described.

By the method generally adopted in the preparation of the old tuberculin, monovalent and polyvalent blastomycetins were derived from culture filtrates of the principal types of fungi under investigation and used in serological and cutaneous tests. So far the results have been positive in two cases and doubtful in two, while seven healthy persons reacted negatively to the treatment.

A bibliography of 76 titles is appended.

GILLIES (M.). **A case of blastomycosis.**—*Canada Med. Assoc. Journ.*, xxix, 2, pp. 183–185, 4 figs., 1933.

Clinical details are given of a case of generalized blastomycosis in a 15-year-old boy in Manitoba. The symptoms of the disease were strongly suggestive of tuberculosis, but a species of *Blastomyces* isolated from ulcers on the arm and leg is considered to have been definitely responsible for the condition, which yielded to the internal administration of potassium iodide. From a review of the recent literature on blastomycosis it is concluded that 95 per cent. of systemic infections are fatal.

ANECK-HAHN (H. G. L.). **Blastomycosis of the central nervous system.**—*South African Med. Journ.*, vii, 11, pp. 369–370, 1933.

Clinical details are given of a fatal case of blastomycosis of the central nervous system in a 35-year-old woman, from whose spinal fluid a typical sprouting blastomycete (? *Torula* or *Cryptococcus*) was isolated [cf. *R.A.M.*, xii, p. 629].

SMITH (L. W.) & SANO (M. E.). **Moniliasis with meningeal involvement.**—*Journ. Infect. Dis.*, liii, 2, pp. 187–196, 2 figs., 1933.

Full clinical details are given of a fatal case of moniliasis with meningeal involvement in an under-nourished, rachitic infant of

22 months. The organism recovered from the lungs and brain appeared, notwithstanding certain minor cultural, fermentative, and serological variations, to be identical with *Monilia* [*Candida*] *albicans* [see next abstract]. The fungus proved highly pathogenic to rabbits, producing definite meningitis as well as focal lesions in the brain on intravenous inoculation.

BENHAM (RHODA W.) & HOPKINS (ANNE McH.). **Yeastlike fungi found on the skin and in the intestines of normal subjects. A survey of one hundred persons.**—*Arch. of Dermatol.*, xxviii, 4, pp. 532–543, 7 figs., 1933.

Monilia [*Candida*] *albicans* was not recovered from the skin or nails of 100 normal young adults, in 72 per cent. of whom, however, other yeast-like organisms were detected in these sites, chiefly *Cryptococcus* and *Mycoderma* spp. Similar organisms were obtained from the tongue or faeces in 80 per cent. of the cases studied, including *C. albicans* in 18 per cent. The absence of this fungus from normal skin and nails supports previous evidence as to its pathogenic rôle in affections of these parts [cf. *R.A.M.*, x, p. 382; xii, p. 569, and next abstract]. In the gastro-intestinal tract, on the other hand, *C. albicans* does not necessarily produce any disturbing symptoms, though its persistent presence in the faeces of persons suffering from cutaneous moniliasis suggests that it may act as a source of skin infection.

CONNOR (I.). **Chronic paronychia due to Monilia.**—*Med. Journ. of Australia*, xx (II), 10, pp. 312–316, 2 figs., 1933.

Monilia [*Candida*] *albicans* was isolated from 14 cases of chronic paronychia at the Melbourne Hospital [cf. *R.A.M.*, xi, pp. 645, 714], the fungus being identified by its morphological and cultural characters and biochemical and serological reactions [details of which are given]. With one exception (a laboratory worker) all the patients were women.

GRIGORAKI (L.). **D'après quelles formes botaniques devons-nous classer les cultures glabres?** [In which botanical groups should we classify the smooth cultures?]—*Comptes rendus Soc. de Biol.*, cxiv, 30, pp. 259–262, 1933.

Discussing the classification of the dermatophytes forming smooth colonies in culture, the writer maintains that the arthrospores are the most constant reproductive organs associated with this type of growth, the aleuria being much less persistent and consequently of little diagnostic value. The genus *Arthrosporia* [*R.A.M.*, iv, p. 478] should therefore be upheld.

GRIGORAKI (L.). **Sur une nouvelle espèce de favus: Arthrosporia gougeroti.** [On a new species of favus: *Arthrosporia gougeroti.*]—*Comptes rendus Soc. de Biol.*, cxiv, 30, pp. 258–259, 1933.

From a generalized favus in a native soldier of Madagascar a fungus was isolated, characterized on Sabouraud's medium by

the production of large chains of plurinuclear arthrospores, 4 to 6 μ in diameter, and of oval aleuria not exceeding 3 μ in length. The macroscopic aspect of the cultures differed from that of *Arthrosporia* (*Achorion*) *schoenleini* in the white, downy surface (pleomorphism) and the fungus is accordingly named *Arthrosporia gougeroti* n. sp. [see preceding abstract].

YI (L. H.). **Die Wachstum verhindernde und abtötende Wirkung verschiedener chemischer Mittel auf Epidermophyton rubrum, Epidermophyton interdigitale und Trichophyton pedis A und B.** [The growth-inhibiting and destructive action of various chemical preparations on *Epidermophyton rubrum*, *Epidermophyton interdigitale*, and *Trichophyton pedis* A and B.]—*Dermatol. Wochenschr.*, xcvii, 43, pp. 1526–1532, 2 figs., 1933.

Thymol (1, 3, 5, or 10 per cent. in 50 per cent. alcohol), Castellani fuchsin, benzoic acid (0·5, 1, or 2 per cent. in 50 per cent. alcohol), and salicylic acid (5 and 10 per cent. in 50 per cent. alcohol) inhibited the growth of honey-agar cultures of *Epidermophyton* [*Trichophyton*] *rubrum*, *E. interdigitale*, and *T pedis* A and B isolated from epidermophytoses of the feet in China [*R.A.M.*, xi, p. 44; xii, p. 630]. Thymol (10 per cent.) destroyed *T. pedis* B in one minute, *T. pedis* A in five minutes, and *T. rubrum* in 1½ hours, but was ineffective against *E. interdigitale* after two hours' exposure. At 0·5 per cent. benzoic acid killed all the organisms in one minute except *T. pedis* A which required five minutes' exposure. All were destroyed by salicylic acid at 5 per cent. in one minute, while fuchsin killed all in the same time except *E. interdigitale*, for which a period of five minutes was necessary. The growth of all the organisms was further inhibited by 10 per cent. resorcin and hexylresorcinol 1 in 1,000 [ibid., xii, p. 509], the latter also killing *T. pedis* A and B and *T. rubrum* in one minute, while *E. interdigitale* withstood its action for 1½ hours. Resorcin at 1 and 3 per cent. inhibited the growth of *T. pedis* A and B, and also of *T. rubrum* at 5 per cent.; at 1 per cent. it killed *E. interdigitale* in 1½ hours, while *T. rubrum* and *T. pedis* A succumbed to 3 per cent. after the same time and *T. pedis* B in two hours.

The inhibitory action of alcohol, carbolfuchsin, mercurochrome 220, sodium thiosulphate, and rivanol was negligible.

MUENDE (I.). **Allergic skin affections related to fungus infection.** —*Post-Grad. Med. Journ.*, N.S., ix, 92, pp. 197–205, 1933.

A review is given of the allergic manifestations [*R.A.M.*, viii, p. 310; x, p. 313] associated with infection by *Trichophyton gypseum*, *Microsporon audouini*, *Epidermophyton* Kaufmann-Wolf, and *Achorion quinckeanum*, for which the terms 'trichophytid', 'microsporid', 'epidermophytid', and 'favid', respectively, are suggested, while 'mycids' (Bloch's term) should be used to cover the whole group. Jadassohn's 'trichophytid' should not, as at present, be applied to the allergic skin affections associated with the other fungi referred to above.

AGOSTINI (A[NGELA]) & FERRARI (A[NGELA]). **Varietà di Sarcopodium fuscum parassita dell'Uomo.** [A variety of *Sarcopodium fuscum* parasitic on man.]—*Boll. Soc. Ital. di Biol. Speriment.*, viii, 5, pp. 1–2, 1933.

From an abscess in the leg of a male patient a fungus was isolated which in culture developed erect, tortuous, simple or (very occasionally) bifurcated, septate, yellowish-brown, sterile hyphae measuring 51·20 to 56·32 by 5·12 to 7·68 μ, short, continuous, hyaline, filiform conidiophores, and elongated, subfusiform, slightly arcuate, hyaline conidia measuring 16·38 to 25·74 by 2·34 to 4·68 μ. The fungus is identified as a species of *Sarcopodium*, differing from *S. fuscum* Corda in the dimensions of the sterile hyphae and conidia (which, in Corda's fungus are, respectively, 300 by 4 μ and 5·6 by 1 μ), and in the nature of its host; it is named *S. fuscum* Corda var. *hominis* Agostini and Ferrari.

COTTON (A. D.). **The detection and control of Lily diseases.**—*ex* Lily Year Book 1933, London, Royal Hortic. Soc., pp. 194–210, 3 figs., 1933.

A semi-popular account is given of three important diseases affecting lilies in the British Isles, namely, leaf spot (*Botrytis elliptica*) [*R.A.M.*, xi, p. 249], mosaic [ibid., xi, pp. 244, 797; xii, p. 292], and yellow flat or rosette (the latter name preferred by the British Mycological Society) [ibid., xi, pp. 97, 244].

In connexion with leaf spot, mention is made of Miss M. R. F. Taylor's recent experiments at Kew, which showed that the mycelium of *B. elliptica* persists throughout the winter in the lesions formed in late summer and autumn on the basal leaf rosette of *Lilium candidum* and renews the production of spores in the spring. Spores are also produced by the sclerotia at any time between March and July. During a spell of hot weather at Kew in July, 1932, the mycelium was destroyed by the sunlight and further sporulation effectually prevented. Close, damp conditions, with frequent showers, are probably the most favourable for severe attacks of the disease. In addition to *L. candidum*, the following species are susceptible to infection by *B. elliptica*: *L. auratum*, *L. croceum*, *L. dauricum*, *L. hansonii*, *L. humboldtii*, *L. martagon*, *L. pardalinum*, *L. speciosum*, *L. testaceum*, and *L. henryi*; while *L. pyrenaicum*, *L. regale*, and *L. willmottiae* are comparatively resistant. Indications are given for the control of leaf spot by cultural measures and the application to the soil and plant bases of calcium bisulphite (4 oz. per gall.) or treatment with a standard fungicide such as Bordeaux mixture or copper-lime dust.

The characteristic symptoms of mosaic [which are described] are commonly observed in a mild form in *L. longiflorum*, *L. tigrinum*, *L. humboldtii*, and *L. croceum*, whereas in *L. auratum* and *L. speciosum* the mottling is much coarser and more conspicuous. The wholesale deterioration of *L. candidum* may be largely attributed, in the author's opinion, to mosaic infection, the symptoms of which, however, are usually masked in the summer. *Aphis gossypii*, the vector of the lily mosaic virus, is abundant on lilies in the greenhouses at Kew and has been found in the open from April

onwards. Control measures, based on the prevention of spread by aphids and the raising of clean stocks, are indicated.

Even mild attacks of rosette preclude the formation of normal flowers. The three most prominent symptoms are marked dwarfing due to shortened internodes; pale colour of the foliage unaccompanied by mottling; and downward curling or twisting of the leaves. Like mosaic, rosette is conveyed from diseased to healthy plants by *A. gossypii*.

This paper (read on 13th July, 1933, at the Lily Conference held by the Royal Horticultural Society) was followed by a discussion (pp. 210–214).

MATHUR (R. N.). **Leaf-curl in Zinnia elegans at Dehra Dun.**—*Indian Journ. Agric. Sci.*, iii, 1, pp. 89–96, 2 pl., 1933.

An acropetal necrosis [*R.A.M.*, xi, p. 740] or leaf curl of *Zinnia elegans*, apparently identical with that of cotton in the Sudan and found to be transmitted by the same vector, *Bemisia gossypiperda*, is stated to be very prevalent at Dehra Dun, India [ibid., xi, p. 573]. A characteristic effect of the disease is the thickening of the lower surface of the veinlets, preceded by curling of the leaf blades. Infection begins at the growing points of the younger leaves and disturbs the normal course of development, so that the diseased plants often fail to attain a height of more than 1 ft. and the flowers are dwarfed, of a poor colour, and partially sterile. During the warm, damp season the axillary buds are forced into growth and form stunted shoots with small, crinkled leaves often massed together in a rosette or bunchy form. Leaf curl is most prominent during the period from July to September, when *B. gossypiperda* is most abundant. A fully detailed and tabulated account is given of the transmission experiments, the results of which left no doubt as to the part played by these insects in the conveyance of infection from diseased to healthy plants. It was found, however, in opposition to Kirkpatrick's observations in the Sudan [ibid., xi, p. 238], that actual feeding on a diseased plant by the adults is a necessary preliminary to transmission of the virus, which was not conveyed by freshly emerged insects reared from nymphs fed on viruliferous material.

GREEN (D. E.). **A Lupin disease due to Ceratophorum setosum (Kirchner), a fungus new to Great Britain.**—*Journ. Roy. Hort. Soc.*, lviii, 1, pp. 144–145, 2 pl., 1933.

Ceratophorum setosum was found in the summer of 1932 infecting a large number of lupin (*Lupinus cytisoides*) seedlings at Wisley, Surrey, this being the first record of the fungus in England, though it has been reported on *Cytisus capitatus* and *C. laburnum* from Germany [also on lupins], Denmark, Switzerland, [and on lupins from Holland, Italy, and Poland: *R.A.M.*, v, p. 672; viii, p. 630, *et passim*]. The foliage showed an extensive greyish-brown spotting, the centre of each circular lesion being very dark brown and the outer portion formed by alternating pale and dark zones, merging into light yellowish-green. Diseased leaves were rapidly killed from the base of the stem upwards. Inoculation experiments

on *C. capitatus* and *C. laburnum* gave positive results. In 1933 *L. cytisoides* was again severely attacked and *L. polyphyllus* in adjacent plots also contracted the infection, but in a milder form. The fusiform, dark brown, 2- to 7- (mostly 5-) septate spores of the fungus measure 62 by 17 μ, and are provided with four or more tapering, hyaline setae, attached to the apical cell and about equal in length to the spores.

MEHLISCH. **Wurzelkropf an Dahlien.** [Crown gall of Dahlias.]—*Ratschläge für Haus, Garten, Feld*, viii, 10, p. 168, 1 fig., 1933.

Crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) is stated to have recently been observed in dahlias [*R.A.M.*, x, p. 79] in Germany, appearing, when the roots are lifted for overwintering, as shapeless, rather hard masses which may reach a considerable size. A second form, consisting of many shoots arising from a cauliflower-like base, may appear in the spring. Control measures should include the eradication and burning of diseased material, dipping the roots before planting in an emulsion of uspulun and loam, soil disinfection with uspulun, and the application of a lime fertilizer.

CREAGER (D. B.). **Leaf scorch of Narcissus.**—*Phytopath.*, xxiii, 10, pp. 770–786, 8 figs., 1933.

Narcissus [*Narcissus* spp.] and amaryllis (hybrids of *Hippeastrum vittatum*) in the eastern United States and elsewhere have been found to suffer considerable damage from leaf scorch (*Stagonospora curtisii*) [*R.A.M.*, xii, p. 79], chiefly affecting the *Leedsii* and *Polyanthus* types of narcissus and occurring on a number of commercial varieties, such as Sir Watkin, King Alfred, White Lady, Queen of the North, Laurens Koster, Orange Cup, Early Perfection, and Victoria. The initial symptoms of the disease consist in yellowish, reddish, or brown lesions, rapidly developing into necrotic areas at the leaf tips; later in the season numerous secondary lesions (the principal source of injury) appear as reddish-brown spots near the primary ones. On susceptible varieties the foliage is partially or wholly destroyed from four to eight weeks before the normal time of death.

Greenhouse and field inoculation experiments with the mycelium and spores of *S. curtisii* gave positive results on Sir Watkin and on a variety of *N. poeticus*. Observations and experimental data indicate, but have not yet definitely proved, that the fungus overwinters in or on the bulbs, which would thus constitute the main source of inoculum for the primary infection. Numerous pycnidia are produced in the necrotic areas. As already noticed by C. O. Smith [ibid., ix, p. 318], the spores of *S. curtisii* are extremely variable in size and septation, the minute, unicellular type predominating under artificial culture conditions, while on the host the majority are quadricellular. Rain water is the chief agent of spore dissemination in the field. The fungus enters the host directly through the cuticle by means of an infection hypha from an appressorium at the tip of the germ-tube and proceeds to form an intercellular mycelium.

MILES (L. E.). **Control of Gladiolus scab.**—*Phytopath.*, xxiii, 10, pp. 802–803, 2 figs., 1933.

Continuing and extending the experiments initiated by H. H. Wedgworth on the control of gladiolus scab (*Bacterium marginatum*) in Mississippi [*R.A.M.*, vii, p. 242], the writer discusses and tabulates the data from four years' work with a number of disinfectants on some named varieties. The best results were obtained by five minutes' immersion in calogreen [ibid., xii, p. 356], used at the rate of 1 lb. in 10 l. water. Next in efficacy came a 1 in 1,000 concentration of mercuric chloride, 8 to 12 hours' immersion, while five minutes in semesan (1 oz. in 12 l.) also gave fairly good control. Calogreen was further effective against soil infestation by *Bact. marginatum* when applied at the rate of 6 oz. per 1,000 ft. Much better control of foliage infection on Pink Beauty was given by six applications of Bordeaux mixture 4–6–50 than by copper-lime dust (20–80).

GANTE (T.). **Der Erikenrost.** [The Erica rust.]—*Blumen- und Pflanzenbau*, xlviii, 9, p. 137, 1933.

During 1933 the rust of *Erica gracilis* and *E. hiemalis* caused by *Uredo ericae* is stated to have been unusually prevalent in Germany. A brief account is given of the symptoms and mode of infection of the rust, with directions for control by spraying with Burgundy mixture or Wacker's copper-lime (A. Wacker, G.m.b.H., Prinzregentenstr. 20, Munich) [*R.A.M.*, xii, p. 74].

WEST (E.). **Powdery mildew of Crape Myrtle caused by Erysiphe lagerstroemiae, n.sp.**—*Phytopath.*, xxiii, 10, pp. 814–819, 2 figs., 1933.

Crape myrtle (*Lagerstroemia indica*) in Florida is liable to infection by a new species of *Erysiphe*, *E. lagerstroemiae* [an English diagnosis of which is given]. Although the perfect stage has been found only in Florida, the same fungus is believed to be responsible for the powdery mildew of this host in other southern States. *E. lagerstroemiae* can survive the winter in the leaf buds, a single application to which of lime-sulphur 1 in 80 at the time of emergence was found to prevent the spread of infection.

PIETERS (A. J.) & HOLLOWELL (E. A.). **Red-Clover failure in relation to anthracnose in the southern part of the Clover belt.**—*U.S. Dept. of Agric. Leaflet* 98, 5 pp., 4 figs., 1933.

This is a popular account (superseding *Farmers' Bull.* 1510) of the symptoms, etiology, and control of red clover [*Trifolium pratense*] anthracnose [*Colletotrichum trifolii*: *R.A.M.*, vii, p. 448; xi, p. 461] in the area south of Pennsylvania and the Ohio River, where it constitutes an important cause of crop failure. Observations and experiments have shown that the one reliable means of combating the disease is the use of resistant seed, which may now be obtained in limited quantities from Tennessee, and is also being grown in parts of Oregon and Idaho.

SAMPSON (KATHLEEN). **The systemic infection of Grasses by Epichloe typhina (Pers.) Tul.**—*Trans. Brit. Mycol. Soc.*, xviii, 1, pp. 30–47, 3 pl., 1933.

Further studies at Aberystwyth of the infection of several species of grasses by *Epichloe typhina* [*R.A.M.*, vii, p. 327; viii, p. 314] showed that for most of the year the fungus develops as an intercellular parasite, penetrating the vegetative organs and overwintering in the perennial parts. The development of the conidial stromata coincides with the flowering period and is closely associated with host fertility. Latent infection may persist for several seasons, the infected plant sometimes remaining barren, sometimes producing some healthy panicles, and sometimes producing panicles containing the fungus but with no visible signs of infection. Mycelium was found in infected plants at all times of the year, and during flowering in the pith of fertile tillers, but it could not be traced in the roots beyond the base covered by the cortical tissues of the stem.

Two contrasted forms of the disease were observed, one on *Dactylis glomerata* and the other on *Festuca rubra*; in the former ascospore formation is abundant and seed transmission absent or rare, in the latter the reverse obtains and the seed transmits the disease.

From the pith of the axis of the inflorescence of *F. rubra* the mycelium passes into all parts of the flower, penetrating the rachilla, glumes, and pales, the filaments and anthers of the stamens, and the tissues of the ovary, extending into the branches of the style. Stamens may be so heavily infected that pollen grains do not form, or the fungus may be found only in the anther walls, and pollen production may be normal. Even in anthers containing mycelium in the pollen sacs some pollen mother-cells divide and produce apparently healthy pollen grains. A similar range of destruction was observed in the ovary. In a very young ovary the mycelium passes between the cells in the integument and nucellus. As the embryo-sac encroaches on the tissues of the nucellus mycelial strands are found within the former. In half-developed ovaries and mature grains the mycelium forms a loose, irregular network outside the aleurone layer round the embryo, and may penetrate the endosperm tissue. Embryo infections were much less frequent than seedling or plant infections, and it is considered that infection of the plumule can take place during germination from intraseminal mycelium near the embryo.

The incidence of the disease in the progeny of various families of open- and self-pollinated plants confirmed the view that the fungus is systemic in *F. rubra* and distributed by infected seed.

It was ascertained that plants of *F. rubra* may be completely invaded by the fungus without having any external signs of infection or any obvious loss in vitality or productivity, thus showing an extreme type of latent infection, comparable to that of the endophyte of *Lolium* [ibid., xii, p. 778].

ATANASOFF (D.). **Bitter pit of Apples: a virus disease?**—*Yearbook Univ. of Sofia, Fac. of Agric.*, xii, pp. 31–67, 25 figs., 1933.

The writer summarizes and discusses the available information

concerning bitter pit of apples [*R.A.M.*, xii, p. 573], an important disease in Bulgaria as elsewhere, and considers the various theories of its etiology that have been proposed. Under the term 'bitter pit' as used by the writer are comprised the conditions variously known as 'blister', 'drouth spot', 'cork' and 'blotchy cork', and 'orchard and storage pit', to each of which certain varieties are particularly inclined in a similar environment. These various injuries [brief descriptions of which are given] tend to appear more or less in the order given above, and several observers have mentioned that they merge into one another. In the writer's opinion the different types seen in the orchard do not deserve to be regarded as distinct diseases, and the storage pit is even more closely related to the orchard type of pitting. It is pointed out that other workers have considered none of the etiological hypotheses of bitter pit [which are briefly summarized] convincing, a fact that encourages the present writer to set forth his theory of a virus origin. An early observation by McAlpine ('Bitter pit investigations. First progress report', 1911–12) to the effect that the disease is most severe in trees grafted on Northern Spy already points in this direction, and may indicate the widespread infection of this commonly used stock, especially as it has been reported both in Australia and South Africa that seedlings may remain free from bitter pit for many years. Mix's experimental data, reported in *New York (Geneva) Agric. Exper. Stat. Bull.* 426, 1916, also lend support to the virus theory. In agreement with Mix and Cunningham, the writer found at the Philippopolis State Nursery that on one tree (White Astrachan) only certain branches were affected while other trees showed a complete gradual decline. A description is given of various symptoms of a number of virus diseases of other plants which the writer considers to show close analogies to bitter pit of apple. These include plum pox [*R.A.M.*, xii, p. 229], potato streak and net necrosis, tomato streak, 'buckskin' of cherry [ibid., x, p. 528], 'black measles' of the vine (with which are synonymous the California vine disease, little leaf, roncet, court noué, arricciamento [ibid., xii, p. 419], mal nero, mosaic, &c.), ring spot [ibid , xii, p. 455] of apples, and infectious variegation [ibid., xii, p. 632]. In fact, just as the term 'curl' formerly covered all virus diseases of the potato, so is 'bitter pit' now used to designate a whole group of allied conditions which can only be separated on the basis of careful study.

BALLOU (F. H.) & LEWIS (I. P.). **Dusting versus spraying Apple orchards in Ohio.**—*Ohio Agric. Exper. Stat. Bull.* 527, 17 pp., 5 figs., 1933.

A fully tabulated account is given of seven years' experiments, from 1926 to 1932, on the comparative merits of dusting and spraying for the control of fungous diseases and insect pests of apples in Ohio [cf. *R.A.M.*, vii, p. 451]. Of the 171 test plots under observation, 97 were dusted and 74 sprayed, all the dusts being compared with the modified dry lime-sulphur-hydrated lime spray which has effectively prevented scab (*Venturia inaequalis*) during the last ten years.

The combination of 15 per cent. refined dry lime-sulphur with pure superfine dusting sulphur proved beneficial for the pre-bloom and petal-fall applications, but for the later ones in warmer weather 10 or 5 per cent. suffices, and in midsummer the lime-sulphur may be omitted as the sulphur is potent enough alone. Copper-lime dust (20–80) gave good control both of scab and Brooks's spot (*Phoma* [*Mycosphaerella*] *pomi*), but was found liable to cause russeting on certain varieties such as Jonathan, for which reason the equally efficacious 10–90 combination is preferable. The Rome variety showed a high degree of susceptibility to scab in these trials, while Jonathan was very resistant, whereas *M. pomi* occurred in a destructive form on Jonathans and caused a fair amount of damage on Rome which responded more favourably, however, to protective treatment, especially with the harmless and inexpensive dilute copper-lime sprays (1½–4½–100 or 2–10–100). On scab-resistant varieties or in seasons adverse to the development of *V. inaequalis* sulphur-lime dusts (50–50) plus lead arsenate at appropriate intervals gave excellent results in the summer applications, following the use of higher concentrations of sulphur at pre-bloom and petal-fall. When dusting and spraying were carried out with equal thoroughness, about the same degree of tree coverage was given by 100 lb. of dust as by 650 to 700 galls. of spray. The average cost of the two treatments is approximately equal, the somewhat higher cost of the dusting materials being offset by the shorter period required for their application. Excellent results were obtained in an orchard on a steep hill slope with a stationary spraying plant [ibid., xii, p. 642], with 1,000 gall. tank capacity and pressure adjustable from 300 to 500 lb.

SUTER (P.). **Erfolge systematischer Baumbespritzung.** [Results of systematic tree-spraying.]—*Schweiz. Landw. Monatshefte, 1933*, 10, pp. 269–277, 13 figs., 1933.

A final inspection at the end of October, 1932, of sprayed and unsprayed apple trees in an orchard near the Lake of Zürich showed almost complete absence of scab [*Venturia inaequalis*] from the fruits of Kassel Pippins of the former group, compared with 100 per cent. infection in the latter. The maximum incidence of leaf scab in the sprayed trees of this variety was 3 per cent. on those treated with 0·15 to 0·3 per cent. cupro-maag [*R.A.M.*, xiii, p. 11] and 18 per cent. on those receiving 2 per cent. lime-sulphur with the addition of 0·1 per cent. copper sulphate at the second pre- and third post-blossom spray and of 1 per cent. lead arsenate at the first post-blossom, the corresponding figure for the controls being 72 per cent. The trees were given seven treatments altogether, beginning with a dormant application of 8 per cent. carbolineum; 0·5 per cent. lead arsenate was added to the first post-blossom spray of 0·2 per cent. cupro-maag. Moderately good control was also obtained on the yellow Bellefleur, Baumann's Pippin, Boskoop, and a few other varieties, but the treatment of Gravenstein and Landsberg Pippin was less successful, partly owing to their exceptionally luxuriant foliage and constant new growth.

DEY (P. K.) & NIGAM (B. S.). **A soft rot of Apple.**—*Indian Journ. Agric. Sci.*, iii, 4, pp. 663–672, 3 figs., 1933.

Aspergillus niger was isolated from market apples affected by soft rot in the United Provinces, India [*R.A.M.*, x, p. 392], sour varieties being particularly susceptible owing to the preference of the fungus for an acid medium (optimum for growth between P_H 3·4 and 3·8). Inoculation experiments on the Amhri variety from Kashmir gave positive results, *A. niger* being reisolated from the characteristic rotted areas. Wounding was found to be a necessary condition of infection. An enzyme secreted by the hyphae was shown to be responsible for the softening of the flesh, and this was destroyed by heating to 70° C.

OSERKOWSKY (J.) & THOMAS (H. E.). **Exanthema in Pears and its relation to copper deficiency.**—*Science*, N.S., lxxviii, 2023, pp. 315–316, 1933.

A marked improvement in the condition of Bartlett pear trees affected by exanthema in California was obtained by spraying with Bordeaux mixture, as well as by the introduction of soluble copper salts into the trunks [*R.A.M.*, vii, p. 643]. Leaf and twig analyses showed the copper content of diseased leaves (3·1 to 5·1 parts per million) to be lower than that of normal leaves from a part of the orchard free from the disease (5·6 to 7·6 p.p.m.) and considerably below that of healthy foliage from localities in which exanthema is absent (11 to 20 p.p.m.). The copper content of healthy-looking leaves from diseased trees was only 3·5 to 4·9 p.p.m. It is considered to be apparent from these data that copper deficiency is directly or indirectly responsible for exanthema in pears.

THORNBERRY (H. H.) & ANDERSON (H. W.). **Overwintering of Phytomonas pruni on Peach.**—*Phytopath.*, xxiii, 10, pp. 787–801, 6 figs., 1933.

In 1930 a new type of twig canker due to *Phytomonas* [*Bacterium*] *pruni* [*R.A.M.*, xii, p. 268] was observed on peach trees in Illinois. These lesions, which have been termed 'spring cankers', developed on young, succulent twigs of the past season's growth in the form of water-soaked, rather dark, raised blisters, about the time of leaf emergence. The cankers are 1 to 10 cm. in length and usually extend half-way round the twig which may, however, be entirely girdled near the terminal bud so that a kind of die-back results. The bacteria are restricted to the cortical tissue; later in the spring the epidermis over the lesions is ruptured and the organisms are then liable to be disseminated to adjacent leaves by rain or dew. The ruptured, infected tissue darkens and dries out during the summer, and forms deep cankers persisting through the following winter. Natural primary foliage infections were observed to be correlated with the spring cankers during three successive years. Trees of the Brackett variety, pruned of their one- and two-year-old twigs to eliminate the spring cankers, did not contract bacterial leaf spot until infection became general in the orchard. *Bact. pruni* was repeatedly isolated from young spring cankers, whereas only 1 in 370 attempted isolations from

over-wintering cankers yielded the pathogen. Cultures of the organism on dextrose-beef extract agar survived the winter of 1930–1 at Urbana and withstood refrigerator temperatures of −2° to 2° C. for five months. Its minimum, optimum, and maximum temperatures for growth are 7°, 25°, and 38°, respectively. In artificial twig inoculations *Bact. pruni* survived the winter of 1931–2 at Yonkers, New York, and produced typical cankers in the following spring.

BERKELEY (G. H.). **Strawberry root rot in England.**—*Nature*, cxxxii, 3336, p. 571, 1933.

The general features of the strawberry root rot in Kent and Sussex plantations are stated to resemble the disease as it occurs in Canada and the United States [*R.A.M.*, xi, p. 251], a conspicuous character being the black lesions on the larger roots and the scarcity of laterals. Of the many fungi isolated from diseased roots at the East Malling Research Station, a species of *Coniothyrium* [ibid., xi, p. 252] has proved consistently pathogenic in inoculation tests, both with an infusion of macerated roots and with pure cultures.

BRAUN (K.). **Der gegenwärtige Stand unserer Kenntnisse vom Stachelbeer- und Johannisbeerrost. (Puccinia ribis D.C. und P. pringsheimiana Kleb.).** [The present status of our knowledge concerning Gooseberry and Currant rust. (*Puccinia ribis* DC. and *P. pringsheimiana* Kleb.).]—*Die Kranke Pflanze*, x, 10–11, pp. 139–143, 1 col. pl., 1933.

From a study of the works of Eriksson, Frank, Gäumann, Klebahn, Laubert, Rabenhorst, Sorauer, Tubeuf, and other authorities on currant rust (*Puccinia ribis*) [*R.A.M.*, x, p. 260] and gooseberry rust caused by *P. pringsheimiana* (*P.* [*ribesii*]-*caricis*) [ibid., xii, p. 381], the writer has compiled a concise, semi-popular account of the symptoms and life-histories of these organisms, preceded by a brief historical sketch and followed by directions for the control of the more important gooseberry rust.

ESMARCH (F.). **Blattfallkrankheit und Säulenrost der Johannisbeere.** [Leaf fall disease and pillar rust of the Currant.]—*Die Kranke Pflanze*, x, 10–11, pp. 137–139, 1 col. pl., 1933.

Notes are given in semi-popular terms on the symptoms, etiology, and control of leaf fall (*Pseudopeziza ribis*) [*R.A.M.*, xii, p. 773] and pillar rust (*Cronartium ribicola*) of currants in Germany.

LÖHNIS (MARIE P.). **Randjesziekte bij Aalbessen.** [Leaf scorch of Red Currants.]—*Tijdschr. over Plantenziekten*, xxxix, 10, pp. 268–275, 2 pl., 1933. [English summary.]

The writer's experiments [details of which are given] on the control of leaf scorch in red currants (Hoorn Yellow Stem) grown in nutrient solutions in culture jars at Wageningen, Holland, by the application of potassium in various forms were completely successful, the condition being prevented equally well by Van der Crone's potassium nitrate solution, potassium sulphate, or potassium chloride [*R.A.M.*, xii, pp. 302, 773].

WILLIAMS (C. F.) & POOLE (R. F.). **The relation of types of pruning to the control of Coniothyrium cane blight.**—*North Carolina Agric. Exper. Stat. Bull.* 291, 14 pp., 7 figs., 1933.

Lucretia dewberries [*Rubus flagellaris*] in the Sandhills section of North Carolina are stated to suffer considerable damage from cane blight (*Leptosphaeria coniothyrium*) [*R.A.M.*, x, p. 506], sometimes in association with *Collybia dryophila*, *Plectodiscella veneta*, and *Mycosphaerella rubi*. The first-named organism enters the plants through newly cut or pruned parts and works downwards below the parts from which fresh shoots arise, thereby severing contact between the tops and the active root portions. Control may be effected by cutting the canes at or immediately below soil level, care being taken not to break the roots or damage the crown.

CHONA (B. L.). **Preliminary investigations on the diseases of Bananas occurring in the Punjab and their method of control.**—*Indian Journ. Agric. Sci.*, iii, 4, pp. 673–687, 3 pl., 3 graphs, 1933.

Notes are given on some diseases affecting bananas in 1932 in an experimental plot at Lyallpur, in the markets of Lyallpur, Lahore, and Jhelum, and in the plantations at Lahore and Amritsar, all in the Punjab. The following were differentiated: main stalk rot, black or finger tip, pseudostem rot, leaf spot, and curvature of the midrib and leaf crumpling. *Gloeosporium* [*musarum*] and *Botryodiplodia* [*theobromae*] [*R.A.M.*, xii, pp. 105, 773] were found to be responsible for the first and the latter for the second, while both fungi were isolated from rotted pseudostems. Leaf spot is characterized by dry, brown areas with a bright yellow margin near the edge of only one-half of the lamina. This disorder being confined to the Cavendish and other varieties ill adapted to local conditions, no attempt at a detailed study has been made. The same is true of the curvature of the midrib and distortion of the leaf blade.

Storage diseases include 'green ripeness', in which the fruit remains green or dull yellow and ripens without developing a palatable flavour, presumably a form of physiological breakdown due to high temperatures; stem-end rot (*G. musarum* and *B. theobromae* [cf. ibid., ix, p. 729], successful inoculation tests with which were conducted), and finger stalk rot (*G. musarum*). Control measures are briefly discussed.

WAGER (V. A.). **A spraying experiment for the control of bacterial black spot in Mangoes.**—*S. African Journ. of Sci.*, xxx, pp. 250–254, 1933.

Satisfactory control of black spot of mango (*Bacillus mangiferae*) [*R.A.M.*, xi, p. 793] in the susceptible small yellow or Kidney variety was obtained in 1932 at Nelspruit by five applications of 4–4–50 Bordeaux mixture (11th August, 4th October, 15th and 29th November, and 21st December) or three of bouisol [ibid., xiii, p. 121] on the three later dates, using 7½ galls. of spray per tree, delivered by an ox-drawn, petrol-driven pump at 300 lb. pressure. The spraying of 20 trees, using two nozzles, occupied about an hour, and the cost per tree of the five applications of

Bordeaux mixture (commercial) is estimated at 3s., a sum that could be halved by using the home-made preparation. The average increase over the controls of 40 per cent. of healthy fruit (80 per cent. when a few large, uniform trees each yielding some 1,500 fruits were compared), resulting from both the treatments proved economically profitable under the conditions of the tests.

BONGINI (VIRGINIA). **Della Phoma eriobotryae.** [On *Phoma eriobotryae.*]—*La Difesa delle Piante*, x, 4, pp. 64–70, 2 figs., 1933.

Continuing her observations and investigations of the disease of loquats (*Eriobotrya japonica*) associated with the previously undescribed *Phoma eriobotryae* [*R.A.M.*, xii, p. 641] the author states that, in culture, pycnospore germination and mycelial development took place at temperatures between 22° and 28° C., the optimum being about 25°. Forty-eight hours after sowing, numerous ochraceous-brown spots or spheroidal hyphenchymatous tufts appeared and two days later these developed into pycnidia containing immature stylospores. On the fifth day from sowing the mature pycnidia emitted characteristic conidial cirrhi. The hyaline, rod-shaped, non-guttulate spores measured 2·5 to 3 by 1·5 μ, being slightly broader in culture than on the host.

Four- to six-year-old loquat trees grown in the open in pots were inoculated with water suspensions of the pycnospores from these cultures (1) by means of cotton steeped in a spore suspension applied to the healthy, uninjured periderm and kept moist, (2) by similar inoculations on healthy branches in which superficial scratches had been made, and (3) by means of a lancet, the spores being introduced directly into the cortical parenchyma and the part kept moist with blotting paper.

A branch of the current year inoculated by the first method showed after ten days a small, sunken, definitely cankered area which gradually enlarged and split; this lesion resembled those from which the fungus had been isolated on the green branches of affected trees. After a fortnight the dead tissue at the raised edges of the canker showed the beginning of pycnidial fructification. The inoculations by the other two methods gave less conclusive results, for though lesions formed they were without the characteristic cell proliferation from below, and no pycnidia formed.

It is concluded that *P. eriobotryae* is able to parasitize the green branches of loquats, on which it produces small cankers limited to the cortical parenchyma and phloem, while on branches of more than a year old its parasitism is uncertain.

In the extended Latin diagnosis which is appended, the pycnidial diameter is given as 80 to 100 μ, in culture up to 190 μ.

JACZEWSKY (A. A.). Основы Микологии. [Elements of Mycology.]—(posthumous: edited by N. A. NAOUMOFF)—1035 pp., 251 figs., State Publishing Office of Agric. & Collective Farming Co-operative Literature, Leningrad, 1933.

In a brief foreword by Naoumoff, it is claimed that this volume represents by far the most complete text-book now existing for the student of pure mycology, as distinct from phytopathology and

systematics, which are not touched upon by the author. The subject matter, which is treated in very considerable detail, is divided into twelve chapters, the first two of which give an account of the origin and development of the science of mycology abroad and in Russia. The remaining chapters deal with the morphology of the vegetative organs of fungi; the structure and contents of the fungal cell; the chemistry of the fungi; the enzymes produced by them; edible and poisonous fungi; the ecology and physiology of the organisms; their natural and artificial substrata (including instructions for growing them in pure culture); reproductive organs and life cycles of the fungi; their geographical distribution and their relations to other plants (including symbiosis); and finally, the teratology of the fungi. The book terminates with a bibliographical index covering nearly 170 pages, an index of the illustrations, an index of the Latin names of the fungi and their hosts cited in the text, and a general subject index in Russian.

Plagas del campo. Memoria del Servicio Fitopatologico Agricola. Año 1932. [Field pests. Memoir of the Agricultural Phytopathological Service. Year 1932.]—*Min. de Agric., Direcc. Gen. de Agric., Secc.* 3ª, 250 pp., 65 figs., 1 map, 1933.

This valuable compilation—the first of a series to be published annually—contains much useful information regarding the investigational, experimental, and supervisory activities of the Spanish agricultural phytopathological stations during 1932. It is preceded by a short account of phytopathological legislation in Spain and of the organization of the Agricultural Phytopathological Service of the country.

STEVENS (N. E.). **Plant pathology and the consumer.**—*Scient. Monthly, 1933*, 10, pp. 325–329, 2 graphs, 1933.

A discussion, supplemented by statistical data from the Bureau of Agricultural Economics, the American Railway Association, and the American Wood Preservers' Association, is given of the problems of decay of fruit and vegetables in transit and of structural timbers in the open. Special reference is made to the losses caused by *Rhizopus* [*nigricans*] in tomatoes and strawberries [*R.A.M.*, xi, p. 585; xii, p. 121] and to those due to apple scald [ibid., xii, p. 703].

SMITH (K. M.). **Some virus diseases of the Potato and other farm crops.**—*Scottish Journ. of Agric.*, xvi, 4, pp. 446–456, 3 pl., 2 figs., 1933.

After defining a virus and briefly touching on some common virus diseases of animals, the writer gives a general survey of present knowledge on the virus diseases of potatoes and other crops and their transmission by means of insects [*R.A.M.*, xii, p. 776].

QUANJER (H. M.). **Onderzoek naar de vatbaarheid voor plantenziekten.** [The investigation of susceptibility to plant diseases.] —*Tijdschr. over Plantenziekten*, xxxix, 10, pp. 263–267, 1933.

A brief discussion is given on the possibilities offered by the

investigation of varietal susceptibility in the control of plant diseases, with special reference to those of potatoes and wheat in Holland. Among the diseases that may eventually be controlled by selection are potato wart [*Synchytrium endobioticum*] and virus disorders, and wheat rusts [*Puccinia* spp.]. In other cases, e.g., that of potato blight (*Phytophthora*) [*infestans*], selection is considered to be of secondary importance compared with direct treatment by applications of Bordeaux mixture, while as regards *Septoria nodorum* on wheat [*R.A.M.*, xiii, p. 10], the first step is to determine the source of infection and see if it can be eliminated.

SCHMIDT (M.). **Über die inneren Ursachen der Widerstandsfähigkeit von Pflanzen gegen parasitische Pilze. (Sammelreferat).** [On the internal causes of the resistance of plants to parasitic fungi. (General survey).]—*Der Züchter*, v, 6, pp. 132–141, 7 figs., 1933.

The writer summarizes and discusses some important contributions [the more recent of which have been noticed in this *Review*] to the study of the factors governing the resistance of plants to parasitic fungi.

WILHELM (A. F.). **Beiträge zur Frage der Antikörperbildung im pflanzlichen Organismus I.** [Contributions to the question of antibody formation in the plant organism I.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 5–7, pp. 107–143, 1 graph, 1933.

In connexion with a critical survey of the problem of antibody formation in the plant organism, the writer repeated Kostoff's experiments on acquired immunity in the Solanaceae [*R.A.M.*, viii, p. 327]. As far as the precipitation capacity of the resultant extracts is concerned, Kostoff's data were confirmed in a general way, but his statements regarding the enhanced precipitation of grafted shoots (involving a mutual induction of antibodies in scion and stock) were found to be erroneous, probably on account of a defective technique and an inadequate number of controls. In agreement with Silberschmidt [ibid., xii, p. 314] the writer failed to detect any difference resulting from the use of extracts of the plant juices in the various Solanaceous grafts tried. In another series of tests pure extracts were used as normal or immune serum, while the antigen solutions were prepared by various methods. The combination of the different extracts or juices by Uhlenhut's technique (*Deutsche Med. Wochenschr.*, p. 1673, 1905) presented the advantage of relatively long persistence of the separation layer, facilitating the detection of ring formation, but here again no indication could be obtained of differences in precipitation capacity between the normal and immune sera.

AYERS (T. T.). **Growth of Dispira cornuta in artificial culture.**—*Mycologia*, xxv, 5, pp. 333–341, 1 pl., 1933.

Dispira cornuta, hitherto regarded as an obligate parasite on members of the Mucorales, was successfully grown to sporulation by the writer in artificial culture on a number of media of animal origin, of which the most suitable were egg in various forms, beef, and swordfish. On vegetable products it failed to grow, while in

liquid media prepared from meat (e.g., nutrient broth, peptone, and the like) it grew but did not sporulate.

RIVERA (V.). **Azione a distanza di metalli. (Prove con Penicillium crustaceum).** [The action of metals at a distance. (Tests with *Penicillium crustaceum*).]—*Atti Pont. Accad. Sci. Nuovi Lincei*, lxxxvi, pp. 184–188, 1933.

Continuing his researches into the effects of radiation upon the growth of plant tissues [*R.A.M.*, xii, p. 82] the author placed Petri dishes containing spores of *Penicillium glaucum* [given in the title as *P. crustaceum* but throughout the text as *P. glaucum*] sown on meat broth agar in zinc, iron, and lead containers kept under similar conditions. Five and a half days later conidia were being actively produced in the lead container, but there was no sign of sporulation in either of the others.

Lead, therefore, acts in the same way on lower as on higher plants in stimulating cellular multiplication. This action is thought possibly to be due to 'secondary radiation' set up by the wall of the container, the intensity of which increases with the atomic weight of the metal.

RIVERA (V.). **Ancora sull'azione biologica dei metalli a distanza.** [Further notes on the biological action of metals at a distance.] —*Atti Pont. Accad. Sci. Nuovi Lincei*, lxxxvi, pp. 240–242, 1933.

The author's investigations into the effect of radiation on the growth of normal and abnormal plant tissues [see preceding abstract] have shown that metal containers, especially when of high atomic weight, stimulate growth when the organism is placed at a distance of a few centimetres from the metal. This effect is diminished, so far, at least, as the lower organisms are concerned, when small containers are used, and becomes transformed into a depressive effect when the container is very small. Whether the effect of such radiation is stimulating or depressive therefore depends on the dosage (i.e., distance of the metal or secondary source of radiation from the organism), and probably also on the kind of organism tested.

KLAPP (E.). **Der Abbau der Kartoffel als Folge von Leistungsüberspannungen.** [Potato degeneration as a sequel to overtaxation of the productive capacity.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, x, 4, pp. 129–146; 5, pp. 161–197, 1933.

Continuing to develop his theory of an ecological basis for potato degeneration [*R.A.M.*, xii, p. 461], the writer considers that the natural constitution and habits of the plant have been subjected to far-reaching disturbances with a view to securing greater productivity. Originating in the mountains, the potato tends naturally to a comparatively short growing period followed by a lengthy winter rest, and cannot be indefinitely maintained in a healthy state under the exactly opposite conditions required for commercial cultivation. Among the factors promoting long duration or intensity of vegetation and thus indirectly favouring

degeneration are a mild climate with a long summer and an abnormally warm and protracted autumn; damp, heavy, fertile soils; and cultural practices aiming at early maturity and high yields.

BOTJES (J. G. O.). **Verzwakking van het virus der topnecrose, en verworven immuniteit van Aardappelrassen ten opzichte van dit virus.** [Attenuation of the virus of top necrosis and acquired immunity of Potato varieties in respect of this virus.] —*Tijdschr. over Plantenziekten*, xxxix, 10, pp. 249–262, 1 pl., 1933.

The grafting of tuber cores of apparently healthy Duke of York, Magdeburger Blaue, Jaune d'Or, Irish Cobbler, and Green Mountain potatoes on the Bravo, Bloemgraafje, Paul Kruger [President], Bevelander, and Industrie varieties causes the development in the latter of top necrosis (acronecrosis) [*R.A.M.*, x, p. 746; xii, p. 319]. The severe form of the disease, typified by necrotic lesions on the upper leaflets, death of the growing points, and internal necrosis of the stems and tubers is designated 'primary top necrosis'. During the process of growth the core-grafted plants make a partial recovery which extends still further in the asexual progeny. During four years' observations at Wageningen, Holland, the only symptoms exhibited by the latter were interveinal mosaic and some spotting of the middle and lower leaves ('secondary top necrosis'). In some cases, indeed, recovery was virtually complete, the sole trace of the original infection consisting in a faint interveinal mosaic or 'attenuated secondary top necrosis'. This condition is transmissible by further grafting, the resultant symptoms being more or less marked in different varieties. The grafting of Duke of York, Magdeburger Blaue, Jaune d'Or, Irish Cobbler, and Green Mountain on Zealand Blue results, not in top necrosis, but in mosaic which persists unchanged in the asexual progeny. When the latter are grafted on Bravo, Bloemgraafje, and Industrie primary top necrosis ensues.

KATTERMANN (G.) & WENK (H.). **Ein neuer Phytophthorabiotyp auch in Bayern?** [A new *Phytophthora* biotype also present in Bavaria?]—*Der Züchter*, v, 6, pp. 129–132, 1933.

Since 1927 work on the breeding of potatoes for resistance to *Phytophthora infestans* has been in progress at the Bavarian Seed Breeding Institute, Weihenstephan. In that year five tubers of each of the resistant strains Ef xii, 2 × Polanin a and Ef xii, 2 × Polanin b (subsequently classified in the collection of the Institute as P1 and P6, respectively), were received for further cultivation from the Biological Institute, Berlin. In the same year P1 was crossed with a hybrid between two commercial varieties (Blochinger × Hindenburg), while in 1928 numerous crosses were made in which the resistant strains supplied the pollen and the early commercial varieties Erstling [Duke of York] and Juli the stigmas. The resultant progenies were designated EP and JP and, like those of the foregoing cross, were exposed to spontaneous infection in the field. From 1930–2 artificial inoculation experiments were carried out on a large scale, involving 5,000 seedlings in 1931 and over 20,000 in 1932, the results of which showed that, even under the very exacting conditions of the tests, the P, EP, and JP strains

were giving a good percentage of highly resistant seedlings, in which even though infection spots developed in the autumn there was no spread of the fungus in the tissues and no sporangia were produced. However, at the end of August, 1932, all the resistant strains and their progeny were attacked in a destructive form by blight, which by that date had been prevalent for some time on the neighbouring susceptible varieties. Apparently a new biotype of the fungus [*R.A.M.*, xiii, p. 53] had appeared. In the normal work of the station it is customary to grow varieties received each year for testing from various places, including v. Kameke's Streckenthin seedlings, and the latter are believed to have introduced the new biotype. Weight is lent to this hypothesis by the fact that the foci of infection occurred mainly in the plots adjacent to Streckenthin material, as well as by the simultaneous outbreak of a late blight epidemic at a branch station of the Bavarian Seed Breeding Institute in the Danube Valley where experimental work with plants of the same suspected origin is also in progress. Other branch stations in the vicinity of Munich remained unaffected by the new biotype, which has evidently, therefore, only recently been introduced on Streckenthin material.

CAIRNS (H.) & MUSKETT (A. E.). **Pink rot of the Potato.**—*Ann. of Appl. Biol.*, xx, 3, pp. 381–403, 1 pl., 1 map, 1933.

Investigations conducted from 1927 to 1932 in Northern Ireland into pink rot of potato tubers (*Phytophthora erythroseptica* and *P. megasperma*) [*R.A.M.*, ix, p. 225; xii, p. 466] showed that sometimes the disease may be systemic in the plant, causing 'misses' and 'pink rot wilt' in the crop. Under conditions of high humidity and poor ventilation heavy losses (up to 50 per cent.) from pink rot may be sustained during storage. In the field tuber infection normally occurs through the mother stolon, but in moist conditions either in the field or in storage the tubers become infected directly, generally through the eyes. In one case recorded almost the entire crop was destroyed. The numerous oospores produced by *P. erythroseptica* in the haulms, stolons, and also, to some extent, in the roots of dead potato plants become disseminated and greatly increase the prevalence of the fungus in the soil, though in most cases the percentage of the crop affected is small. Even in the absence of the host it appears that the fungus may persist indefinitely in the soil. Inoculation experiments showed that *P. cryptogea* and *P. cactorum* could also cause typical pink rot.

Satisfactory crops can be grown in contaminated soil if strongly sprouted tubers are planted and the soil is well drained. Early harvesting and dry, well-aerated storage conditions also greatly reduce the risk of serious losses.

NAPPER (R. P. N.). **Report on diseases of the Rubber tree in Kedah.**—*Journ. Rubber Res. Inst. Malaya*, v, 1, pp. 35–47, 1933.

In this brief report of his extensive tour in February 1933 of the main *Hevea* rubber growing districts of the State of Kedah, the author gives some notes on the chief diseases observed by him affecting the roots, stems, branches, and tapping panel of *Hevea*

rubber trees, most of which are well known to rubber pathologists. The problems presented by these diseases are discussed, particularly in their relation to the local climatic conditions, and the paper terminates with a few considerations of general interest to the local rubber growers.

BEELEY (F.). **Oidium heveae. Report on the 1933 outbreak of Hevea leaf mildew.**—*Journ. Rubber Res. Inst. Malaya*, v, 1, pp. 5–13, 5 graphs, 1 map, 1933.

The author states that in the spring of 1933 reports of *Hevea* mildew (*Oidium heveae*) [*R.A.M.*, xii, p. 323] outbreaks in Malaya came chiefly from the coastal districts of Negri Sembilan and Malacca, where light rains during the early part of March caused a rapid and almost epidemic spread of the disease. The attack ended about the first week in April, and the recovery towards the end of that month was remarkably good, owing probably to the onset of regular, fairly heavy rains. Observations indicated that while trees of all ages may be attacked by the mildew, the older trees suffer more severely than the younger, and also that the inflorescence is still the favourite site for the fungus. The paper terminates with a brief discussion of control measures, most of the experiments on which have already been noticed in this *Review* from other sources.

SHARPLES (A.). **Lightning damage in Rubber plantations.**—*Journ. Rubber Res. Inst. Malaya*, v, 1, pp. 22–28, 4 figs., 1933.

This paper is stated to be largely a reproduction of the information given in a previous communication concerning the significance of lightning injury to *Hevea* rubber plantations in Malaya, an abstract from which has already been published in this *Review* [*R.A.M.*, xii, p. 507].

BAYLISS ELLIOTT (JESSIE S.). **Some soil fungi of Hartlebury Common.**—*Proc. Birmingham Nat. Hist. & Phil. Soc.*, xvi, 4, pp. 93–100, 9 figs., 1933.

Taxonomic notes are given on two of the nine fungi isolated from the soil of Hartlebury Common, near Stourport [Worcestershire] in 1931, viz., *Volutella roseola* and *Pistillaria quisquiliaris*. A detailed study of bread agar cultures of the former revealed it as the sporodochial stage of a *Cephalosporium* indistinguishable from *C. acremonium*. Among the other organisms found were *Penicillium roseum* (*P. hypomycetis*) and *Periconia felina*, also reported from the salt marshes of the Dovey Estuary [Wales: *R.A.M.*, ix, p. 740].

ARCENEAUX (G.), STOKES (I. E.), BISLAND (R. B.), & KRUMBHAAR (C. C.). **Variety tests of Sugarcanes in Louisiana during the crop year 1931–32.**—*U.S. Dept. of Agric. Circ.* 298, 31 pp., 1933.

The immense losses (amounting to over $100,000,000) caused by sugar-cane mosaic in Louisiana during the decade just completed are attributed by the writers to the absence, in the early stages of the epidemic, of disease-resistant varieties adapted to local condi-

tions, the development of which is also of importance in connexion with the red rot [*Colletotrichum falcatum*: *R.A.M.*, xii, p. 724] and root rot [ibid., ix, p. 132] problems. Their production became an aim of primary importance, therefore, when breeding and varietal testing work was undertaken by the Division of Sugar Plant Investigations of the Bureau of Plant Industry.

During 1931–2 C.P. 807 (a Canal Point, Florida, seedling variety) has consistently outyielded the former favourite P.O.J. varieties 213, 234, and 36-M by 10 tons or more of cane per acre, besides showing resistance to the above-mentioned diseases (immunity from mosaic and high resistance to root diseases, in particular)—qualities entirely outweighing certain less desirable characters such as crooked stems and rather high fibre content. Co. 281 has manifested an increasing susceptibility to mosaic [ibid., xii, p. 786] but resists all the strains (except one) of *C. falcatum* [ibid., xii, p. 724], particularly the dominant strain attacking P.O.J. 213. In the opinion of pathologists this variety, though possibly less valuable than was originally believed, is worthy of extended cultivation in the immediate future on account of its many superior qualities. The extreme susceptibility of P.O.J. 213 to red rot, except under almost ideal soil conditions, renders its cultivation in Louisiana very hazardous. Co. 290 has not been so fully tested as C.P. 807 or Co. 281, but it has qualities which may make it a very advantageous variety for local cultivation.

Ocfemia (G. O.), Hurtado (E. A.), & Hernandez (C. C.). **Distribution of mosaic and Fiji diseases in Sugar Cane stalks; effects of these maladies on the germination of the eyes and transmission of the viruses by pin pricks.**—*Philipp. Agric.*, xxi, 6, pp. 385–407, 6 figs., 1933.

In the Philippine Islands Fiji disease of sugar-cane has been found to be transmitted by *Perkinsiella vastatrix* Breddin, the first records of the successful experiments of Ocfemia with this insect having appeared in the *Philippine Agriculturist* and in the *Sugar News* (Manila) for October and November, 1932, respectively, while a detailed report on the work is in the press. In Australia *P. saccharicida* is stated to be the vector [ibid., xii, p. 787] so that probably several species of allied insects can transmit the disease. Germination tests with one-node cuttings of 16 commercial varieties of native and imported canes showed that both mosaic and Fiji disease are distributed throughout the stalks of the infected plants. Every shoot arising from the buds of all the mosaic P.O.J. stalks used in these trials proved to be infected, the occasional apparent absence of leaf mottling in some of them being merely due to masking [ibid., xii, p. 245], as was shown by the fact that they proved capable of transmitting infection to healthy plants. All the shoots from Fiji-diseased cane showed the disease. It was found that in some varieties the percentage of eye germination was reduced by mosaic and Fiji disease, while in others the healthy plants produced fewer eyes than the infected ones, indicating that germination is influenced by some factor independent of the diseases under observation.

Experiments in the artificial transmission of mosaic by juice

inoculations through pin pricks proved successful in a large number of cases, but similar attempts to transmit Fiji disease failed.

UNAMUNO (L. M.). **Notas micológicas. VI. Algunas especies nuevas o poco conocidas de la micoflora española.** [Mycological notes. VI. Some new or unfamiliar species of the Spanish mycoflora.]—*Bol. Soc. Española Hist. Nat.*, xxxiii, 6–7, pp. 221–235, 6 figs., 1933.

Continuing his series of taxonomic observations on fungi collected in different parts of Spain [*R.A.M.*, xii, p. 330], the writer enumerates 32 species (including four new ones), of which the following may be mentioned. *Alternaria tenuis* f. *genuina*, characterized by 3- to 5-septate, dark olivaceous conidia, 27·5 to 50 or up to 62·5 by 12 to 17·5 μ, was found on the leaves, peduncles, floral buds, and unripe fruits of *Capsicum annuum* (a new host for Spain) in Valencia, where heavy losses have been caused by the fungus during the past few years. The species under observation is quite distinct from *A. solani*, previously reported on the same host [ibid., xii, p. 354]. *C. annuum* fruits in the same province are also liable to infection by *Gloeosporium capsici* n. sp., a species characterized by large, whitish-yellow acervuli, a brown, parenchymatous basal stroma of round to polygonal cells 8 to 20 μ in diameter, and cylindrical, straight or slightly curved, hyaline to yellow, densely granular conidia, rounded at both ends or pointed at one, 18 to 23 by 6 to 7·5 μ, borne on filiform, simple, hyaline conidiophores, 25 to 32 by 5 to 6 μ. *Lolium perenne* and *L. rigidum* leaves in Logroño were attacked by *Puccinia glumarum*, the latter a new host for the country. *P. glumarum* f. *bromicola* was observed on *Bromus maximus* and *B. rubens*, the latter bearing some biseptate teleutospores. *Uromyces renovatus* occurred on the leaves of *Lupinus hirsutus* (a new host) in Seville.

OVERHOLTS (L. O.). **Mycological notes for 1930–32.**—*Mycologia*, xxv, 5, pp. 418–430, 3 pl., 1933.

In continuation of previous notes of the same series [cf. *R.A.M.*, x, p. 130], the writer describes 34 species of fungi (one new), mostly from Pennsylvania. *Fusicoccum persicae* Ell. & Ev., with spores measuring 20 to 24 by 4 to 6 μ (slightly larger than the dimensions originally given), was found causing the death of peach twigs, the injury on which was similar to that associated with *Valsa leucostoma* [ibid., x, p. 41].

Septoria sibirica on *Ribes vulgare* has been confused in its immature stages with *Cylindrosporium ribis*. It differs from *S. ribis* [*Mycosphaerella grossulariae*] in the smaller dimensions of the pycnidia (30 to 45 μ in diameter) and the considerably longer spores (21 to 75 by 2 μ).

VERWOERD (L.) & DU PLESSIS (S. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa. V.**—*S. African Journ. of Sci.*, xxx, pp. 222–233, 1933.

Critical and taxonomic notes are given on 29 species of fungi

(continuing a previous list) [*R.A.M.*, xii, p. 192] not hitherto recorded from South Africa, of which nine are considered to be new to science and are accompanied by English and Latin diagnoses. *Ascochyta kentiae* produces pale grey, coalescent spots with a narrow, brown margin on the leaves of *Oreodoxa regia*, killing them from the tip downwards. *Colletotrichum brachytrichum* was identified as the agent of a grey to light brown spotting of cacao leaves, which are also liable to infection by *Phyllosticta theobromae* [ibid., ix, p. 632]. *C. orchidearum* produces irregular lesions with an indefinite, yellowish halo on the leaves of *Cryptopodium punctatum*. The leaves of *Ribes vulgare* are attacked by *Cylindrosporium ribis* [see preceding abstract], producing semicircular to elliptical, slightly sunken, pale grey spots with a dark brown margin. The leaves of *Coelogyne cristata* are destroyed by *Gloeosporium affine* [ibid., vi, p. 617], the olive-green to light brown lesions due to which are surrounded in the later stages by a broad olive-green margin. Cinnamon (*Cinnamonum zeylanicum*) leaves are infected by *Leptosphaeria cinnamomi*, producing circular to elongated, irregular, sometimes marginal, brownish-grey spots with a narrow, dark margin.

Septoria avenae [ibid., ix, pp. 225, 625] produces elongated to lenticular, pale greyish-brown spots with a broad purplish margin on oat leaves at Stellenbosch and in the Malmesbury and Moorreesburg districts.

The death of *Lantana camara* shoots is caused by *Phoma lantanae* n. sp., characterized by subepidermal, erumpent, globose to depressed-globose pycnidia, 80·6 to 155·2 by 71 to 145·6 μ; and hyaline, smooth, muticate, continuous, elliptical to ovoid conidia, 3·4 to 6·1 by 1·2 to 1·8 μ, borne on hyaline, simple conidiophores, 5·1 to 9·7 μ long, sharply tapering towards the apex. *Pyrenochaete vanillae* n. sp. produces marginal, sunken, dark brown, later grey spots, surrounded by a yellow halo, on the leaves of *Vanilla planifolia* which are killed by the infection. The amphigenous, subepidermal, erumpent, subglobose to depressed-globose pycnidia, 71 to 134·9 μ in diameter, are surrounded by dark brown, aseptate setae at the apex, which measure 25·5 to 59·5 by 3·5 to 5 μ; the hyaline, smooth, muticate, continuous, ovoid to elliptical pycnospores measure 6·8 to 11·7 by 1·2 to 1·8 μ; the conidiophores are hyaline, irregularly branched, slender, and 10·3 to 15·8 by 0·9 to 1·8 μ in diameter.

DU PLESSIS (S. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa. VI.**—*S. African Journ. of Sci.*, xxx, pp. 206–211, 1933.

Critical and taxonomic notes are given on eleven species of fungi not hitherto recorded from South Africa [see preceding abstract], of which five are considered to be new to science and are accompanied by English and Latin diagnoses. *Coniothyrina agaves* (Dur. & Mont.) Pet. & Syd. [*R.A.M.*, ix, p. 561] was found producing whitish-grey lesions of irregular extent on the leaves of *Agave americana*, which ultimately died as a result of the infec-

tion. *Pleospora herbarum* was observed in association with the *Sphaeropsis* stage of *Macrophoma aloës* on dead leaves of *Aloë* sp.

ZUNDEL (G. L.). **New and rare North and South American Ustilaginales.**—*Mycologia*, xxv, 5, pp. 349–355, 1933.

An annotated list is given of five rare and eight new species of smuts from the western United States and Brazil occurring on various Gramineae [cf. *R.A.M.*, ix, p. 744]. The new species are accompanied by Latin diagnoses.

ARTHUR (J. C.). **New genera and species of Uredinales.**—*Bull. Torrey Bot. Club*, lx, 7, pp. 475–476, 1933.

In this brief note the author establishes, among others, the new genus *Cumminsiella* [with a Latin diagnosis] to include three fungi on *Mahonia* [*Berberis*], namely, *C. sanguinea* (Peck) Arth. nov. comb. (*Puccinia mirabilissima* [*R.A.M.*, xii, p. 578], *Uromyces sanguinea* Peck (1879), *Uropyxis mirabilissima*, and *U. sanguinea*), *C. wootoniana* nov. comb. (*U. wootoniana*), and *C. texana* (Holw. & Long) Arth. nov. comb. (*P. texana*, *U. texana*, and *Aecidium butlerianum*). This genus separates from *Uropyxis* those species having subepidermal pycnidia and cupulate aecidioid aecidia.

ARTHUR (J. C.) & CUMMINS (G. B.). **Rusts of the Northwest Himalayas.**—*Mycologia*, xxv, 5, pp. 397–406, 1 fig., 1 map, 1933.

An annotated list is given of 89 rusts comprising 165 collections made by R. R. Stewart in the North-western Himalayas (Punjab, Kashmir, North-west Frontier Province, and near Mussoorie, United Provinces, India), including five new species [with Latin diagnoses] and two new combinations. Twenty species of rusts and 34 hosts do not appear in previous lists of Indian fungi [*R.A.M.*, xi, p. 545; xii, p. 395], and are considered to be new records for the country.

Aecidium orbiculare, found on *Clematis connata*, *C. grata*, and *C. montana*, approximates closely in morphological characters to the aecidial stage of *Puccinia rubigo-vera* [see next abstract], and may be referable to that species, which occurred on *Aquilegia pubiflora*, *A. vulgaris*, *Thalictrum minus*, *T.* sp., and *Triticum* sp., the first- and third-named being new hosts.

Cronartium ribicola was detected on a new host, *Ribes orientale*, in Kashmir [cf. ibid., viii, p. 78].

The twigs and leaves of *Cotoneaster bacillaris* and *C. rosea* showed extensive malformations due to infection by *Gymnosporangium distortum* n. sp., the pycnidia and aecidia of which are scattered over the diseased area.

Rosa (?) *webbiana* was attacked by *Phragmidium kamtschatkae* (Anders.) Arth. & Cumm. comb. nov. (*Puccinia rosae* Barclay 1889). The latter name is antedated by Persoon (1801), so that *P. kamtschatkae* Anders. becomes the first valid name for this species. Tranzschel's *Phragmidium rosae* (1928) is antedated by Rostrup's use of this combination for *P. disciflorum* (Tode) James.

Lettuce (*Lactuca* (?) *decipiens*) was infected by *Puccinia opizii* [ibid., xiii, p. 10].

MAINS (E. B.). **Studies concerning heteroecious rusts.**—*Mycologia*, xxv, 5, pp. 407–417, 1933.

Critical and taxonomic notes are given on ten species (one new) of heteroecious rusts from various parts of the United States, which were studied in connexion with the investigations on the leaf rust of grasses (*Puccinia rubigo-vera*) already reported [*R.A.M.*, xii, p. 499]. Inoculation experiments on *Berberis fendleri* with the teleutospores of *P. koeleriae* from *Koeleria cristata* in 1920 resulted in profuse infection, sometimes causing the formation of a compact rosette of leaves bearing pycnidia and aecidia. Well-developed uredo- and later teleutosori were produced on *K. cristata* and *Trisetum sesquiflorum* following inoculation with the aecidia of *P. koeleriae* from *B. fendleri*. *P. koeleriae*, *P. arrhenatheri* [ibid., xii, p. 506], and *P. montanensis* all produce their aecidial stages on species of *Berberis* or *Mahonia*, suggesting the possibility that, as these rusts form a connected series with *P. glumarum*, these two genera may also be aecidial hosts of the latter.

LINDER (D. H.). **The genus Schizophyllum. I. Species of the western hemisphere.**—*Amer. Journ. of Botany*, xx, 8, pp. 552–564, 4 pl., 1933.

Six species of *Schizophyllum* from the western hemisphere are described, figured, and their synonymy listed, the two new ones, *S. brevilamellatum* from Venezuela and *S. leprieurii* from French Guiana (both on dead wood) being furnished with Latin diagnoses. All occur in the tropics except *S. commune* [*R.A.M.*, xi, pp. 84, 318], which appears to be rare in tropical regions. *S. radiatum* (Swartz) Fr., originally described from Jamaica, is stated to be parasitic on sugar-cane.

VERONA (O.). **Sulla sistematica delle 'Mycotoruleae' Cif. et Red.** [On the systematic grouping of the Mycotoruleae Cif. et Red.]—*Nuovo Giorn. Bot. Ital.*, N.S., xl, 2, pp. 225–229, 1 pl., 1933.

In this revision of the genera of the sub-family Mycotoruleae Cif. et Red. of the Torulopsidaceae the author accepts in general the conclusions of Ciferri and Redaelli [*R.A.M.*, v, p. 229; viii, p. 676; xi, p. 642], but proposes that *Eumycotorula* n. subgen., *Enantiothamnus*, and *Mycotoruloides* should be considered as subgenera of *Mycotorula*, and he divides *Candida* similarly into two subgenera, *Eucandida* and *Mycocandida*, differing chiefly in the greater mycelial development and more prominent verticils of the latter.

FISHER (EILEEN E.). **The 'sooty moulds' of some Australian plants.**—*Proc. Roy. Soc. Victoria*, N.S., xlv, 2, pp. 171–202, 1 pl., 18 figs., 1933.

In this account of her investigations into the sooty moulds of indigenous Australian plants the author states that on the leaves of *Bursaria spinosa* the mould consisted of a mixture of fungi forming a definite association. She observed sessile, spherical, glabrous perithecia containing asci and muriform ascospores and agreeing with those of herbarium specimens determined by McAlpine as *Capnodium walteri*, a species described on the same host from

Australia by Saccardo. These perithecia, however, are quite different from the flask-shaped perithecia with long necks and protruding asci with phragmosporous ascospores described and figured by Saccardo, who apparently confused pycnidia with perithecia, pycnidia and pycnospores resembling the perithecia and ascospores of Saccardo being also present in the author's material and referred by her to the form genus *Hendersoniella*. A second pycnidial form, referred to *Chaetophoma*, also occurred in the material examined, but in single ascospore cultures only the first type developed. The conidial stage of a *Phycopsis* was also present, which from its distinct cultural characters was evidently unconnected with the perithecial form; a similar conidial form is stated to occur commonly on leaves attacked by various Capnodiaceae. *Macrosporium* and *Cladosporium*-like spores were also present, but not obtained in culture from the ascospores or pycnospores. It is concluded that the sooty mould on *Bursaria* consists of several fungi, the perithecial form with elongated pycnidia being determined as *Capnodium salicinum*, the correct name for which the author, in agreement with Arnaud, considers to be *Teichospora salicina* (Mont.) Gäum.

On *Leptospermum scoparium* the sooty mould consisted of a mixture of two perithecial forms, various pycnidial types (*Chaetophoma*, *Hendersoniella*, *Microxyphium*, &c.), sterile forms, and forms represented by conidial (*Cladosporium*, *Dematium*) stages only. One type of perithecium was glabrous, spherical, borne on a stalk and usually solitary, with a thick, black, carbonaceous wall, and contained asci with brown, muriform, 3-, later 5- to 6- septate ascospores. This type was similar in many respects to that figured for *Capnodium australe* Mont., and also resembled *C. cistophilum* Fr. The second type was spherical, sessile, glabrous, borne terminally on beaded hyphae, and outwardly resembled the pycnidia of *Chaetophoma* but contained asci and hyaline, bicellular, probably immature ascospores. The muriform-spored perithecial form is referred to *C. australe*, the more correct name for which is *T. australe* (Mont.) Arnaud. Maire figured only unbranched perithecia in his account of *C. cistophilum*, but as branched perithecia were rare in the author's fungus and the ascospore measurements and figures given by Maire closely agree with those of the immature ascospores of *T. australe*, the name *C. cistophilum* is included as a synonym. No cultural evidence was obtained of the genetic connexion of the perfect with the imperfect forms found in this mould.

On *L. laevigatum* the mould was also due to a mixture of fungi. Inoculations from infected material gave cultures consisting of a densely black growth belonging to *Chaetophoma* and identical with that from *B. spinosa* and *L. scoparium*, an unidentified white form possibly associated with a *Phycopsis*, and a dark olivaceous perithecial form identified at the Imperial Mycological Institute as *Pleospora herbarum*. An abundant development of perithecia occurred in cultures on honey agar (the medium chiefly used in the author's work), but the conidial stage, *Macrosporium sarcinula*, was produced only on *Myoporum* agar and on synthetic media in which ammonium sulphate or ammonium nitrate was used as a source of

nitrogen. The brown muriform ascospores had seven transverse septa. The connexion between *M. sarcinula* and *P. herbarum* was confirmed by cultural work.

On *Myoporum insulare* [*M. serratum*] the only sooty mould fungus observed in nature was a *Phycopsis*.

On *Melaleuca* sp. the sooty mould was composed of *Limacinia fuliginodes*, this being the first Australian record of this fungus. The name *L. melaleucae* nomen nudum appears to have been used in 1899, but from the examination of McAlpine's type material of this fungus in comparison with descriptions of *Limacinia* recorded by Saccardo it was identified by the author as *L. crassa* (Pat.) Sacc. The perithecial stage of *T. australe* and mucilaginous cushions of *Phycopsis* sp. without propagula were also associated with the mould on this host.

A bibliography of 37 titles is appended.

SMITH (G.). **Some new species of Penicillium.**—*Trans. Brit. Mycol. Soc.*, xviii, 1, pp. 88–91, 2 pl., 1933.

Notes are given on four new species of *Penicillium*, three of which were isolated during an investigation conducted in 1927–9 of the fungal infections of manufactured cotton goods, while the fourth was obtained in 1931 by the late J. H. V. Charles from mouldy Italian maize. Of the cotton organisms, *P. pallidum* n. sp. and *P. varians* n. sp. were obtained from yarn showing no sign of mildew, and are regarded as part of the latent infection usually carried by cotton, while *P. raistrickii* n. sp. was isolated from mouldy yarn, and was responsible for part, at least, of the damage. The remaining organism, *P. charlesii* n. sp., is stated to show unique biochemical reactions. The cultural characters of the four species are described and Latin diagnoses are given.

MANDELSON (L. F.). **Tobacco diseases.** ***ex*** **Tobacco growing in Queensland.**—*Queensland Dept. of Agric. & Stock*, pp. 48–76, 8 pl., 1933.

This information on tobacco diseases occurring in Queensland and elsewhere has already been noticed from another source [*R.A.M.*, xi, p. 76] and is also issued in the form of a Pathological Leaflet (No. 22 of the Queensland Department of Agriculture and Stock).

PRICE (W. C.). **The thermal death rate of Tobacco-mosaic virus.**—*Phytopath.*, xxiii, 10, pp. 749–768, 2 graphs, 1933.

Using the local lesion method for measuring virus concentration [*R.A.M.*, ix, p. 810; xi, p. 526, *et passim*], the writer found that the undiluted juice of ordinary mosaic tobacco (Johnson's tobacco virus 1) was inactivated in one minute at 96° C., in ten at 93°, in 80 at 90°, in 32 hours at 85°, in 12 days at 80°, and in 40 at 75°. Virus in juice of mosaic tobacco plants diluted 1:20 with water was completely inactivated in one minute at 92°, in ten at 88°, in 70 at 85°, in 13 hours at 80°, in 72 at 75°, and in 20 days at 68°. Thermal death point determinations made with virus in juice diluted with water or with healthy tobacco extract indicate that

the inactivation process is influenced by the concentration of virus and solids in the dispersing medium.

WOLF (F. A.). **Roguing as a means of control of Tobacco mosaic.** —*Phytopath.*, xxiii, 10, pp. 831–833, 1933.

The writer's observations in North Carolina from 1928–30 indicated that healthy tobacco plants, set in fields that had carried a mosaic-infected crop the previous year, do not ordinarily show more than a small proportion of diseased plants at the time of the first cultivation. Under such conditions early roguing is an effective check to the spread of mosaic. On the other hand, the roguing of fields planted with seedlings from infested seed-beds is inadvisable, since it necessitates the removal of too large a proportion (10 per cent. and upwards) of infected plants.

WOLF (F. A.) & MOSS (E. G.). **Effect of mosaic of flue-cured Tobacco on yield and quality.**—*Phytopath.*, xxiii, 10, pp. 834–836, 1933.

The results of experiments at Oxford, North Carolina, in 1929–30 showed that both the yield and quality of flue-cured tobacco are adversely affected by mosaic, the extent of the damage depending on the stage of growth at which infection takes place [*R.A.M.*, vii, p. 123; viii, p. 533]. Thus, the two-year average yield of the plot inoculated at setting time was 655 lb. compared with 1,000 lb. from the healthy plot—a decrease in quantity of 31·4 and in value of 54·6 per cent. The corresponding figures on the plot inoculated about a month after transplanting were 692 lb., 30·1, and 42·1 per cent., respectively, and on that inoculated at topping time, 825 lb., 17·2, and 23·8 per cent., respectively. Judging by three seasons' observations, the writers conclude that mosaic is seldom as destructive under natural conditions as on the two earliest inoculated experimental plots above-mentioned, but there may well be an average incidence of 20 per cent. mosaic at topping time, resulting in a decrease of yield and value exceeding that shown by the third plot.

BUSCH (H. J.) & WOLF (F. A.). **Manufactured Tobacco, a source of inoculum for mosaic in flue-cured Tobacco.**—*Phytopath.*, xxiii, 10, pp. 839–841, 1933.

In 1929 the virulence of samples of 45 brands of manufactured tobacco was tested by their application to healthy tobacco leaves. After 12 to 18 days some of the plants inoculated with two brands of chewing tobacco and two of snuff showed symptoms of mosaic, while those infected by the remaining 41 failed to contract the disease. Chewing tobacco made from mosaic leaves and applied after curing to the healthy foliage of potted plants either as spittle or by sprinkling after soaking in water caused infection in about a fortnight. It is apparent from these tests, the results of which agree with those of Valleau and Johnson [*R.A.M.*, vii, p. 124] and Fukushi [ibid., x, p. 694], that the mosaic virus persists in occasional samples of certain brands of manufactured tobacco.

SAMUEL (G.) & BALD (J. G.). **Tomato spotted wilt on Tobacco.**—*Journ. Dept. Agric. S. Australia*, xxxvii, pp. 190–195, 6 figs., 1933.

In South Australia tomato spotted wilt [*R.A.M.*, xi, p. 549 ; xii, p. 730] though usually present only on isolated tobacco plants is a common disease of this crop, to which it is transmitted by *Frankliniella insularis* and *Thrips tabaci* [ibid., xi, p. 78]. On tobacco, the symptoms [cf. ibid., xi, p. 608] consist of necrotic spots on the younger leaves, necrotic areas along the lateral veins, usually on the lower half of the leaf, and often on one side only, a characteristic mottle due to the invasion of all the fine veins in the lower half of the leaf (there being usually in this case a coarser pattern bordering the veins immediately above the area fully invaded), and various combinations of these symptoms, as well as irregular necrotic spots and line patterns. The colour changes vary from yellowish-green in the mottled area to reddish-brown or white in the necrotic spots and lines. The top of an affected plant ceases growth and in the early stages may be slightly bent over to one side. Dark sunken streaks may appear on the stem, and dark necrotic areas or cavities may be found in the cortex or pith. Infected plants remain at a standstill for some weeks, after which the leaves droop and die and the plant soon succumbs. Occasionally, instead of dying the plants develop a distorted secondary growth, and new, almost normal, leaves may form, but are in turn liable to develop necrotic symptoms.

Control consists in removing other susceptible hosts [ibid., xi, p. 549] from the vicinity of the tobacco and burying infected material as soon as detected.

MANIL (P.). **Contribution à l'étude d'une maladie bactérienne du Tabac, constatée en Belgique.** [A contribution to the study of a bacterial disease of Tobacco observed in Belgium.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, ii, 3, pp. 244–268, 3 pl., 1933. [Flemish, German, and English summaries.]

In July 1932, from 2 to over 90 per cent. of the tobacco growing in some of the plantations in the valley of the Semois, south-eastern Belgium, were attacked by the disease resembling wildfire (*Bacterium tabacum*) previously reported from this locality [*R.A.M.*, xii, p. 7]. Healthy fields were seen in close proximity to diseased ones, and diseased and healthy patches sometimes occurred in one and the same field, though the conditions were apparently identical throughout. Spread occurred by leaf contact and probably also by insect transmission, and ceased about the middle of August. In the parts most severely affected the value of the crop was reduced by 30 per cent. The disease was also noted at Mons, Tournai, and Poperinghe.

The symptoms consisted in smooth, pale- to yellowish-brown spots, 1 to 2 mm. in diameter and with a yellow halo averaging 0·5 cm. wide, scattered over the lower leaves, and later coalescing into dry, translucent, sometimes perforated areas. The presence or absence of the halo and its duration when present were very variable, largely depending on the variety.

A bacterium was isolated, needle-prick inoculations with which gave nearly 100 per cent. positive results. Experimental infections were also obtained by means of *Aleurodes* [*Trialeurodes*] *vaporarium* and a *Macrosiphum*. This organism resembled *Bact. angulatum* [cf. ibid., x, p. 62] except that it did not produce indol, and *Bact. tabacum* except that it did not coagulate milk. In litmus milk it produced a violaceous blue ring which gradually rose above a series of increasingly lighter rings; after 11 days clarification was visible in the lower part, while in 3 days the P_H value rose from 6·52 to 6·94. The production of acids with glucose was very weak. The P_H value of 4 per cent. meat broth agar was reduced in 6 days from 6·51 to 6·26. In Cohn's medium the organism grew well and showed the characters of *Bact. melleum* as described by Săvulescu [ibid., ix, p. 207]. In glucosed alkaline liquid media growth occurred only on the surface. The organism resisted desiccation for 10 to 12 days; its virulence remained unaffected after exposure to 50° for 10 minutes, but death ensued after 72 hours at 37°. No reduction in virulence was noted after one year's growth on meat broth agar (12 transfers).

From the close similarity of the symptoms with those of wildfire in France and from the identity of the author's organism with a culture of *Bact. tabacum* obtained from that country, the author concludes that the disease present in Belgium is definitely wildfire.

A list is given of the reaction to inoculation of 17 varieties of tobacco and another of the numerous species of plants which were successfully inoculated with the Belgian tobacco organism. *Atropa belladonna* was observed naturally infected.

ARMSTRONG (G. M.) & ALBERT (W. B.). **Downy mildew of Tobacco on Pepper, Tomato, and Eggplant.**—*Phytopath.*, xxiii, 10, pp. 837–839, 1933.

Attention is drawn to the occurrence in 1933 of downy mildew of tobacco (*Peronospora hyoscyami*) on tomato, pepper [*Capsicum annuum*: *R.A.M.*, xii, p. 732], and eggplant in South Carolina. The measurements [which are tabulated] of 600 spores each from tobacco and the other hosts left no doubt as to the identity of the causal organism. The disease has only appeared on these three hosts since the outbreak of tobacco downy mildew in the areas concerned and its artificial transmission from tobacco to pepper was effected under controlled conditions.

SHEAR (G. M.). **Field and laboratory studies on frenching of Tobacco.**—*Virginia Agric. Exper. Stat. Tech. Bull.* 49, 14 pp., 4 figs., 1 chart, 1933.

When ammonium sulphate, superphosphate, potassium sulphate, sodium chloride, and stable manure, respectively, were applied to plots of Burley tobacco on a clay loam soil in Virginia, frenching [*R.A.M.*, xii, p. 205] developed in a well-defined area unrelated to the treatments but on which the appearance of the disease in successive years had coincided with periods of heavy rain. The stable manure and ammonium sulphate plots showed a smaller percentage of affected plants than the adjacent untreated plots, but the potas-

sium sulphate and superphosphate appeared to make no difference in this respect.

In the greenhouse, frenched plants growing in pots containing the same clay loam from an area producing frenching recovered after applications of sodium nitrate or ammonium sulphate, as well as after improved soil aeration. The addition of absorbent cotton to the soil (to reduce the available nitrates through the competing requirements of the cellulose-decomposing micro-organisms) aggravated the disorder, the plants showing signs of nitrogen deficiency. The condition could not be corrected by spraying the foliage of affected plants with sodium nitrate or by supplying the nitrate to roots growing beneath the pots, though when nitrate was applied to the soil in the pots at the same rate recovery took place.

Frenching could not be induced in water cultures as a result of nitrate deficiency, inadequate aeration, or both combined.

The partial sterilization of soil that normally produced frenching prevented the condition when the treatment was strong enough to kill weed seed in the soil.

Frenching appeared in soils the P_H value of which ranged from 5·8 to 7·9, the rate of development being greatest between $P_H 7$ and 7·55, decreasing quickly above this range, and falling more gradually as acidity increased.

That the condition occurred in sand cultures watered with the solution leached from soil that produced it is held to indicate that frenching is a toxicity, and not a deficiency, disease [ibid., xi, p. 807].

AINSWORTH (G. C.). **An investigation of Tomato virus diseases of the mosaic 'stripe', streak group.**—*Ann. of Appl. Biol.*, xx, 3, pp. 421–428, 2 pl., 1933.

Further investigations by the author into virus diseases of the tomato [*R.A.M.*, xii, p. 730] showed that ordinary or mild tomato mosaic and authentic tobacco mosaic (Johnson's No. 1) each produced mottling with malformation and stunting on tomato, tobacco, *Nicotiana macrophylla*, eggplant, *Solanum ciliatum*, *Physalis pubescens*, *Capsicum annuum*, and *Petunia*, but did not infect cucumber. On tobacco no necrotic local lesions were produced, infection always being systemic; slight clearing of the veins was succeeded by a dark green mottle and by a degree of stunting and leaf distortion that depended on the season. On *N. glutinosa* necrotic local lesions developed, but infection never became systemic and the virus could not be reisolated. On *Datura stramonium* numerous necrotic local lesions were produced; infection was never systemic but sometimes dark brown lesions developed on the petiole and the part of the stem below the node of an inoculated leaf.

On *N. glutinosa*, *D. stramonium*, *S. ciliatum*, *P. pubescens*, and *C. annuum* the symptoms of glasshouse streak [ibid., ix, p. 747; xii, p. 731] were identical with those of tobacco mosaic. On tomato, glasshouse streak symptoms agreed with those of stripe (attributed to *Bacillus lathyri*), but in addition a mottle identical with that due to tomato mosaic sometimes developed, and was often the only symptom, agreeing with one form of tomato mosaic

described by Gardner and Kendrick [ibid., i, p. 401]. On tobacco necrotic lesions, eventually reaching up to 6 mm. in diameter, developed two to four days after inoculation, adjacent lesions sometimes coalescing into large necrotic areas: this was occasionally the only symptom. Sometimes, primary systemic infection followed at once, a necrosis spreading rapidly down the petioles of the inoculated leaves into the younger ones. The plant was often killed, but if it survived growth was very slow and the leaves were mottled and developed necrotic lesions between the veins. Plants showing only local lesions grew normally, and no virus could be isolated from the upper parts. Later, some of these plants showed an internal stem necrosis which rapidly spread upwards, causing a vein necrosis of the apical leaves (secondary systemic necrosis); the virus could then be isolated unchanged. Growth became arrested, and if resumed was generally due to the development of an axillary bud near the base. On eggplant, tomato mosaic produced no local lesions, and the systemic symptoms were a very slight mottle and stunting whereas glasshouse streak caused chlorotic areas or necrotic lesions on the inoculated leaves together with a severe necrosis of the veins, causing the leaves to dry up and fall; some necrosis of the stem and petioles was also present.

One strain of tomato mosaic was observed for eighteen months and others for shorter periods but no variant arose, the symptom picture remaining remarkably constant. No strain of glasshouse streak reverted to tomato mosaic. Tomato mosaic did not produce tomato stripe; glasshouse streak inoculations gave a mixture of mottled and striped plants, and further inoculations from these gave both mottled and striped plants, irrespective of the parent type: the virus always retained its identity on different hosts and under different treatments. When tobacco plants were inoculated with a mixture of tomato mosaic and glasshouse streak, the tomato mosaic was recovered in a pure state from the plants in which the glasshouse streak component produced only local lesions. In a commercial tomato crop there is often a mixed infection with these two viruses, but tobacco can be used for filtering out the glasshouse streak component.

The symptoms of mixed virus streak [ibid., xii, p. 731] are identical with those of glasshouse streak, but the former differs from the latter in that it nearly always gives 100 per cent. of streak plants on inoculation, while glasshouse streak is more capricious. There are also differences in incubation period, longevity of the virus, and the like. In young plants this streak rarely gives only a mottle, and when it does, plants inoculated from such a plant show tomato mosaic symptoms only.

On tomato the symptoms of mixed virus streak are the same whether the potato mosaic component is combined with tomato mosaic or glasshouse streak, but on tobacco, while local lesions are produced by both mixtures, the tomato mosaic mixture produces severe necrosis of the leaves above those inoculated, whereas the glasshouse streak mixture produces severe leaf necrosis only in certain plants, others showing only systemic symptoms due to the potato mosaic component, in which case tobacco can be used to separate the potato mosaic.

RAINIO (A. J.). **Untersuchungen über ein Fäulnisbakterium der Tomatenfrüchte (Bacillus aroideae Townsend).** [Studies on a rotting bacterium of Tomato fruits (*Bacillus aroideae* Townsend).]—*Valtion Maatalouskoetoiminnan Julkaisuja* 45, 29 pp., 9 figs., 1932. [Finnish summary. Received January, 1934.]

In 1930 the writer observed that greenhouse tomatoes in a commercial nursery, besides showing infection by *Cladosporium fulvum* and *Phytobacter lycopersicum* [*R.A.M.*, x, p. 494], both common in Finland, were attacked by *Bacillus aroideae* [ibid., xii, pp. 121, 332, 421], causing a yellowish-brown, malodorous rot of the still green fruit. The morphological, cultural, and biochemical characters of the organism are fully described. The results of inoculation experiments on the Erste Ernte [First Harvest] and Alice Roosevelt varieties denoted that the bacterium is a wound parasite which thrives only at a temperature approaching its optimum of 35° C., so that serious damage to outdoor tomatoes is unlikely in Finland, where the mean open air temperature from 28th July to 10th August, 1930, was only 15° to 18°. Positive results were obtained in inoculation tests on the seed capsules of a number of other greenhouse plants, including *Papaver orientale*, *Iris germanica*, *Hemerocallis hybrida*, *Trillium grandiflorum*, *Fritillaria meleagris*, and *Allium bulbiferum*. Good control of the tomato rot was secured on a small scale by the application of 2 per cent. Bordeaux mixture, but it is not expected that such treatment will be generally necessary under Finnish conditions.

WAGER (V. A.). **A stem rot of transplanted Tomatoes due to Pythium aphanidermatum (Eds.) Fitz.**—*S. African Journ. of Sci.*, xxx, pp. 247–249, 1933.

In May, 1932, and January, 1933, tomato seedlings at the Sub-Tropical Research Station, Nelspruit, were attacked a week after transplanting by *Pythium aphanidermatum* [*R.A.M.*, xi, p. 330], causing a soft rot of the stem 2 to 3 in. above soil level, followed by the collapse and death of some 20 per cent. of the plants. Inoculation experiments through the soil were successful only during the summer, indicating that high temperatures are necessary for the pathogenic activity of the fungus. The disease was further observed to be more virulent among deep-planted seedlings than in shallow plantings. *P. aphanidermatum* is stated to be widely distributed in the Transvaal and Cape Colony on tobacco, in the former province also on tomato, on eggplant and *Sechium edule* at Nelspruit, on tomato and squash [*Cucurbita* sp.] at Windhoek, South-West Africa, and on bracken (*Pteridium aquilinum*) at White River, Transvaal.

WAGER (V. A.). **Fusarium wilt in Tomatoes in South Africa.**—*S. African Journ. of Sci.*, xxx, pp. 240–246, 1933.

Serious losses are stated to be caused annually in the tomato crops of the Eastern Transvaal lowveld by *Fusarium bulbigenum* f. 1 Wr. (*F. lycopersici*) [*R.A.M.*, xii, p. 732 ; xiii, p. 101], which causes a yellow to brown discoloration, wilting, and ultimate death of the leaves. Inoculation experiments showed great differences

in virulence between the various strains of the organism, which has also been found on papaw infected by foot rot and on a wilted carnation. Of the numerous species of *Fusarium* from a wide host range used in inoculation experiments, only *F. bulbigenum* f. 1 was capable of inducing wilt in tomatoes. The fungus was detected on four seeds from 16 samples of tomato seed obtained from different merchants, indicating the possibility of introducing the disease into new localities on the seed. The optimum temperature for the growth of *F. bulbigenum* f. 1 was found to be about 80° F., a fact that explains the greater virulence of wilt in the hot weather. All the seven wilt-resistant American varieties, viz., Columbia, Norton, Norduke, Marvana, Marvelosa, Marglobe, and Marvel, grown in the infected area during 1927–8 showed a very satisfactory performance compared with the commonly grown Beauty, and attempts are in progress at the Sub-Tropical Research Station, Nelspruit, to produce from the best of these a highly resistant variety adapted to local conditions.

KREUTZER (W. A.) & DURRELL (L. W.). **Collar rot of Tomatoes.**—*Colorado Agric. Exper. Stat. Bull.* 402, 12 pp., 5 figs., 1 graph, 1933.

Collar rot of tomatoes (*Macrosporium* [*Alternaria*] *solani*) [*R.A.M.*, xi, p. 355 and above, p. 151] was observed in the Arkansas and Grand Valleys of Colorado in 1931, causing a loss of 20 per cent. of some crops. The symptoms of the disease are briefly described, with observations on the environmental conditions favouring the development of the fungus. The presence of *A. solani* in the seed-bed soil was found to reduce germination by an average of 46 per cent. Field experiments showed that infection does not spread from plant to plant, since the organism migrates too slowly through the soil to reach the host before it attains maturity and resistance. Deep transplanting is commonly followed by root formation above the site of attack and is suggested as a means of control. Soil sterilization by steam or with 1 in 50 formaldehyde is also recommended.

PEARSON (R. S.). **Report of the Director of Forest Products Research for the year 1932.**—*Rept. Forest Products Res. Board for the year 1932*, pp. 3–51, 9 pl., 1 fig., 2 graphs, 1933.

Tests are in progress at the Forest Products Research Laboratory, Princes Risborough, to ascertain the effect of stain-producing fungi on the strength of the wood, *Ceratostomella coerulea* and *C. cana* being selected as the fungi and the sapwood of Scots pine [*Pinus sylvestris*] as the timber. The progress of the infection was found to be extremely slow.

In the test plots of wood preservatives [*R.A.M.*, x, p. 142] many of the specimens originally laid down have developed considerable decay; all the creosoted stakes are sound but some of those treated with water-soluble preservatives are affected, though much less so than the untreated controls, most of which are now decaying. That the failure of the water-soluble preservatives was due to the preservative becoming leached out of the timber was confirmed by the perfect soundness of specimens kept without exposure to leaching.

Progress was made in estimating the resistance of home-grown and Empire timbers to the attacks of fungi growing under controlled conditions. the method used being similar to that employed in wood-block tests of antiseptics [ibid., xi, p. 487]; after four months the blocks of Western red cedar (*Thuja plicata*) were still free from any fungal growth.

The collection of wood-destroying fungi maintained in pure culture [ibid., xii, p. 342] has been expanded and some tropical forms included; cultures of fungi attacking timber in Australia were received through the co-operation of the Australian Division of Forest Products.

A detailed study was begun of the rots attacking English oak [*Quercus robur*] and descriptions are being prepared of those affecting both standing trees and felled timber.

In a room in the experimentally constructed house [ibid., xi, p. 487] *M. lacrymans* had covered the greater part of a hollow floor with no ventilation beneath, in 18 months after inoculation. The moisture content of the test samples placed in contact with the joists ranged from 25 to 40 per cent. of the dry weight, a moisture content of over 27 per cent. being found only in samples attacked by the fungus. In the same room alternate boards were removed from a part of the floor where *M. lacrymans* was in active growth and were replaced by boards of *T. plicata* and *Tsuga heterophylla*; after nine months the latter was slightly attacked but the former unaffected. In a 'well-constructed' room with adequate ventilation under the floor no fungal growth took place, though each section of the floor was twice infected with wood on which *M. lacrymans* was in active growth.

Evidence was obtained that in the advanced stages of its attack on wood *Armillaria mellea* is capable of attacking lignin [ibid., xii, p. 343]. Ten distinct forms of white rot were studied chemically and the results obtained tended to support the view that all fungi of this type decompose carbohydrates as well as lignin; no uniformity, however, prevails as regards the order or proportion in which the different components of wood are decomposed.

STEVENS (N. E.). **United States: the Dutch Elm disease discovered in New Jersey.**—*Internat. Bull. of Plant Protect.*, vii, 10, pp. 229–230, 1933.

Further notes are given on the distribution of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the United States. Up to 27th July, 1933, 69 infected trees, from which the fungus was isolated and determined in culture, were found in 14 towns and cities in three counties of New Jersey [*R.A.M.*, xiii, p. 64], all within 20 miles of New York City. As soon as definite determinations are made the diseased trees are removed and burnt. A single new case was discovered early in 1933 in Cleveland, where the first cases were found in 1930 [ibid., ix, p. 749].

WOODWARD (C. H.). **Surveying for Dutch Elm-disease.**—*Journ. New York Bot. Gard.*, xxxiv, 406, pp. 222–224, 1933.

In September, 1933, a survey of Westchester County, New York,

for the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [see preceding abstract] was initiated by P. V. Mook and assistants, who discovered two cases. Similar work is in progress in Massachusetts and Connecticut. According to R. K. Beattie, ten other infected trees have recently been found in New York State, the fungus being isolated from the affected material in every case. In New Jersey the number of authenticated cases of *C. ulmi* infection is stated to have increased from 69 to 309 since 31st July, 1933.

RIVERA (V.). **Prospettive di lotta contro il marciume radicale del Gelso.** [Prospects of the control of Mulberry root rot.]—*Atti Pont. Accad. Sci. Nuovi Lincei*, lxxxv, pp. 112–120, 3 figs., 1932. [Received December, 1933.]

To ascertain whether falchetto diseases of mulberries [*R.A.M.*, ix, p. 7] might be treated by a hot water treatment of the seedlings without injury to the latter, the author inoculated six-day old mulberry seedlings with *Armillaria mellea* and exposed them in specially constructed thermostats for 48 hours to soil temperatures ranging from 20° to 58° C., some of the plants also being kept at −2° for 24 hours.

Although the effects of the inoculations were inconclusive, definite evidence was obtained of the marked resistance of the seedlings to heat, exposure even to 58° only temporarily arresting growth.

The application of boiling water (1 l. per 0·055 c.m. of soil) to the foot of young mulberry plants in full vegetation resulted in their death after one month.

JØRGENSEN (C. A.) & FERDINANDSEN (C.). **Destruktionsfaenomener i Bøgetræ, foraarsaget af Hypoxylon coccineum Bull.** [Destruction phenomena in Beech wood caused by *Hypoxylon coccineum* Bull.]—*Dansk Skovforen. Tidsskr., 1933*, 9, pp. 389–402, 5 figs., 1933.

Beech logs in Danish forests have recently been damaged by a white rot of the inner portions of the wood, which was found by isolations from the diseased tissues to be caused by *Hypoxylon coccineum*. The fungus has never been found by the authors on a living substratum, and infection presumably takes place on the felled material by means of the oval, hyaline conidia (3·5 to 4 by 2·5 to 3 μ), arising on erect, branched conidiophores from a greenish to greyish-brown stroma, and constituting the conidial stage, *Trichosporium tulasnei*, of *H. coccineum*. The mycelium is able to persist for months in the interior of the wood, the decay of which does not reach an advanced stage until the late summer. The brownish-red to black stromata of the perfect stage are formed in or on the bark or on the naked wood. During the winter of 1932–3 beech railway sleepers in various places were found to be damaged by *H. coccineum*, accompanied to a slight extent by *Stereum purpureum*. On the bark of felled beech logs in the forest *Quaternaria persoonii* was present in abundance but apparently played no part in the rotting. A characteristic feature of the latter is the streaky effect produced by the intervening strips

or 'islands' of healthy tissue; black lines frequently mark the separation of the infected from the sound wood.

Insect transmission of spike disease.—*Nature*, cxxxii, 3337, pp. 592–593, 1933.

It is stated that in a forthcoming paper by M. Appanna and C. Dover details will be reported of the successful transmission of what appears to be true spike disease of sandal [*Santalum album*: see next abstract] in three cases by means of the Jassid *Moonia albimaculata*. Proof of the identity of the disease by grafting from the artificially infected trees has still to be given.

RAO (Y. V. S.). **Contributions to the study of the spike-disease of Sandal (Santalum album, Linn.). Part XIII. Investigation of the hexone bases. Part XIV. Study of mosaics associated with spiked areas.**—*Journ. Indian Inst. Sci.*, xvi A, 8, pp. 91–95, 1933.

It has already been shown [*R.A.M.*, ix, p. 213] that the onset of spike disease of sandal (*Santalum album*) [ibid., xii, p. 479] is accompanied by a distinct increase in the basic nitrogen content of the leaves. The basic fraction has now been partitioned into individual aminoacid components by Van Slyke's method, the material used consisting of two healthy and two spiked samples from two areas near Bangalore, South India. The total amounts of nitrogen in the diseased samples from the two areas were 2·21 and 1·43 per cent., respectively, compared with 1·77 and 1·94 per cent. in the healthy ones; water-soluble nitrogen 0·78 and 0·39 per cent. in the spiked and 0·56 and 0·37 per cent. in the healthy samples; basic fraction 0·19 and 0·12 per cent. (diseased) and 0·09 and 0·08 per cent. (healthy). The spiked samples contained large quantities of histidine (42·1 and 16·7 per cent. compared with 3·3 and 0·4 per cent.), the conversion of which into histamine is believed to explain the necrosis of the spiked root ends.

In a number of areas in South India characterized by the prevalence of spike disease in the sandal trees, mosaic symptoms were observed in some of the local weeds, such as *Gisekia* and *Ageratum* spp. Since it was absent from districts free from spike, biochemical investigation of the *Ageratum* mosaic was undertaken in two areas with a view to tracing a possible correlation between the two conditions. Mosaic-diseased *Ageratum* leaves were found to contain almost as much calcium as normal ones, whereas in spiked sandal foliage the calcium content is low. On the other hand, diseased *Ageratum* leaves contained less phosphoric acid (0·43 and 0·89 per cent.) than healthy ones (0·78 and 1·88 per cent.). There was a striking increase in the ammoniacal nitrogen content of mosaic *Ageratum* foliage (3·4 and 2·8 per cent. free ammonia compared with 1·2 and 0·9 per cent. in healthy samples), indicating a similarity to tobacco mosaic and spinach blight [ibid., xii, p. 673] rather than to sandal spike, in which the ammoniacal nitrogen content is not appreciably modified. Conversely, diseased *Ageratum* does not show the high basic nitrogen content typical of spiked sandal.

Ross (H.). **Über nicht parasitäre Hexenbesen an Robinia pseudacacia.** [On non-parasitic witches' brooms on *Robinia pseudacacia*.]—*Ber. Deutsch. Bot. Gesellsch.*, li, 7, pp. 292–300, 6 figs., 1933.

A 70- to 80-year old *Robinia pseud-acacia* tree on an estate visited by the writer near Frankfurt a. Oder bore towards the tips of the lowest lateral branches witches' brooms 1·5 to 2 m. in diameter [cf. *R.A.M.*, xii, p. 405]. No flowers were produced by the brooms, thorns were rudimentary or absent, and the late developing leaves were somewhat larger than the normal. Instead of one axillary bud there were several, arranged in decreasing order of size, between the leaf axil and the main axis, and the witches' brooms arise through the simultaneous development of these axillary buds which would normally have remained dormant. The structure of the 'brooms' formed in this manner was quite irregular. Near the peripheral portions of the brooms were numerous rod-shaped, unbranched, fairly long, upward-tending shoots similar to the water-shoots at the base or in the crown of old trees.

The shoot axes of the witches' brooms were generally more vigorous than those of the normal parts of the tree, the average basal diameter at one year old being 4 to 6 mm.; the internodes were shorter and their angles less acute. On an average the pith occupied $\frac{5}{10}$ to $\frac{6}{10}$ of the shoot axis of a broom, and the xylem and cortex $\frac{1}{10}$ to $\frac{2}{10}$, the corresponding figures for a normal axis being $\frac{3}{10}$ to $\frac{4}{10}$ and $\frac{6}{10}$, respectively. The xylem of the broom axes also contained more and larger vessels and more tyloses.

All attempts to propagate the witches' brooms by grafting gave negative results. No evidence of parasitic infection was forthcoming [ibid., vi, p. 706], and the trees had not been exposed to injury by animals. The possibility of bud mutation, due to specially copious nutrition, is discussed.

Hahn (G. G.). **An undescribed Phomopsis from Douglas Fir on the Pacific Coast.**—*Mycologia*, xxv, 5, pp. 369–375, 1 pl., 1933.

The green form [var. *viridis*] of the Douglas fir (*Pseudotsuga taxifolia*) at Lokoya, Napa County, California, was observed in 1930 to bear conspicuous cankers caused by a species of *Phomopsis*, which was shown by comparative systematic studies to be morphologically and culturally distinct from the four related conifer parasites, *P. juniperovora*, *P. occulta*, *P. pseudotsugae*, and *P. strobi* [*R.A.M.*, x, p. 278] and is accordingly named *P. lokoyae* n. sp. [with English and Latin diagnoses]. It is characterized by erumpent, conical, lenticular, or subglobose, truncate pycnidia, averaging 300 to 565 μ broad and 175 to 300 μ in height; pycnospores emerging in a whitish tendril or mass from a single locule lined with a hymenial layer of slender, flexuous, subulate, subacutely pointed sporophores 5 to 20 μ long, from the tips of which are abstricted unicellular, hyaline A- and B-spores, the former elliptic-fusoid, oblong-elliptic, or oblong with obtuse or subacute extremities, commonly biguttulate, 4·8 to 10 by 1·6 to 4 μ (200 spores), mostly 6 to 10 by 2 to 4 μ; and the latter of the

scolecosporic type, with obtuse or subacute extremities, 9 to 14·2 by 1·4 to 3·2 μ (mostly 10 to 12 by 1·5 to 2·5 μ). The perfect stage is unknown.

BOYCE (J. S.). **A canker of Douglas Fir associated with Phomopsis lokoyae.**—*Journ. of Forestry*, xxxi, 6, pp. 664–672, 1 fig., 1933.

A full account is given of the Douglas fir (*Pseudotsuga taxifolia*) canker caused by *Phomopsis lokoyae* n. sp. [see preceding abstract], which was found in 1930 scattered through the coast ranges of northern California and extending northwards into southern Oregon. The disease, which is stated exactly to resemble that caused by *P. pseudotsugae* in Great Britain, was confined to saplings (up to 20 years old) on poor sites, generally below 2,500 ft. above sea level, and occasioned only negligible damage. The local epidemic of 1929–30 is attributed to favourable weather conditions for the fungus. Incense cedars [*Libocedrus decurrens*], sugar pines [*Pinus lambertiana*], and *P. ponderosa* were also attacked in a few places.

On the trunk the elliptical cankers averaged 3 to 8 in. in length and 1 to 2 in. in width, with a maximum of 32 by 3 in., while those on the branches ranged from less than an inch to 1 ft. or more in length. The cortex and cambium were killed, but the sapwood was not directly injured. The end of a leader or of a lateral branch was sometimes killed back for two to three internodes, a sudden increase in thickness marking the passage from the diseased to the healthy portion of the stem. The short terminal or lateral shoots on the twigs were commonly destroyed. Pycnidia were formed in profusion in the spring and early summer on the dead bark of cankers and of killed-back leaders or branches, as well as on the bark of trees that had died from drought and other causes. The cankers are apparently annual, being formed during the dormant period of the host and generally persisting for one season only, though an occasional approach to the perennial habit was observed. As a rule the trunks bore only one or two cankers (six or eight being exceptionally found) and rapid healing usually took place. Infection leading to cankers seemed mostly to occur through dead branches or twigs, rarely through wounds. An examination of old cankers indicated that the disease was of long standing, dating back at least to 1914–15 and probably much earlier. In the writer's opinion the causal organism is indigenous to the region under observation, but the mild character of the disease and the improbability of further serious damage do not at present justify intensive studies.

MORSE (ELIZABETH E.). **Its ancient enemy discovered. The Incense Cedar reveals the secret of its destruction.**—*Amer. Forests*, xxxix, 11, pp. 502–503, 1933.

A popular account is given of the damage caused to the incense cedar [*Libocedrus decurrens*] along the Pacific coast by *Polyporus amarus* [*R.A.M.*, x, p. 571], the scarcity of information on which may be due to the infrequent development of the brown sporophores and their destruction by birds in the search for insect food.

The fungus works in both standing and felled trees and has been known to continue in the latter for 27 years. The rotted wood disintegrates into cubical blocks, the 'pockets' being sometimes so wide as to render it useless even for underpinning or fence posts. The incense cedar, despite the value of its wood, is officially rated as an 'inferior species' owing to the heavy losses caused by *P. amarus*, which could be largely avoided by precautions against wounding and fire.

HEDGCOCK (G. G.) & HUNT (N. R.). **Notes on some species of Coleosporium.—III.**—*Mycologia*, xxv, 5, pp. 392–396, 1933.

Continuing their series of critical and taxonomic notes on some species of *Coleosporium* [*R.A.M.*, ii, p. 348], the writers describe the results of successful inoculation experiments on *Veronia* spp. with *C. carneum*, on *Elephantopus* spp. with *C. elephantopodis*, and on *Laciniaria* spp. with *C. laciniariae*, all collected on *Pinus* spp. in the United States. *C. heterothecae* n. sp., occurring in profusion on *Heterotheca* (*Inula*) *subaxillaris* in Florida (which may have its aecidial stage on *P. palustris*, though this has not yet been established), is furnished with Latin and English diagnoses.

HIRATSUKA (N.). **Inoculation experiments with heteroecious species of the Japanese rust fungi.**—*Bot. Mag.*, Tokyo, xlvii, 562, pp. 710–714, 1933.

Notes are given on the writer's inoculation experiments with eight heteroecious Japanese rusts [cf. *R.A.M.*, xii, p. 726], amongst which the following may be mentioned. Needles of *Abies mayriana*, *Larix kaempferi*, and *Picea jezoensis* were inoculated with the germinating teleutospores of *Pucciniastrum kusanoi* from fallen leaves of *Clethra barbinervis*. Spermogonia developed only on the first-named conifer ten days after inoculation, followed in another nine days by peridermia. *C. barbinervis* was successfully inoculated in turn with aecidiospores from *A. mayriana*, uredosori appearing in ten days. The amphigenous, subcuticular, lenticular to flattened-hemispherical, honey-yellow spermogonia on *A. mayriana* measure 90 to 150 μ across and 45 to 60 μ in height; the oblong, smooth, hyaline spermatia are 3·5 to 5·5 by 1·2 to 2 μ; the hypophyllous, biseriate, cylindrical aecidia measure 0·5 to 2 mm. in length by 0·24 to 0·32 mm. across; the rhomboidal or hexagonal, overlapping peridial cells have smooth and thin outer, and verrucose, thicker inner walls, and measure 50 to 69 by 12 to 18 μ; the globose, subglobose, or ellipsoidal aecidiospores measure 18 to 25 by 13·5 to 18 μ, and have a hyaline, densely verrucose epispore.

FISCHER (E.). **Die Rostepidemie der Rottanne in den Alpen in Herbst 1932.** [The rust epidemic on Spruce in the Alps in the autumn of 1932.]—*Mitt. Naturforsch. Gesellsch. Bern, 1932*, pp. xx–xxi, 1933.

A brief abstract is given of a lecture on the life-history of *Chrysomyxa rhododendri* [*R.A.M.*, xii, p. 67] and of the conditions governing the epidemic occurrence of the rust on spruce [*Picea*

excelsa] in the Swiss Alps. Intensely severe outbreaks, such as that of 1932, are due to the exact coincidence between the development of the basidiospores on the Alpine rose [*Rhododendron ferrugineum* and *R. hirsutum*] and the period of greatest susceptibility on the part of the needles. The damage caused by the rust is not very heavy, no appreciable thinning of the affected stands having occurred during the centuries since the disease was first recognized, though the present gradual decline in the density of the forests may be partially attributable to this cause.

LIESE (J.). **Vererbung der Hexenbesenbildung bei der Kiefer.** [The inheritance of the witches' broom habit of growth in the Pine.]—*Zeitschr. für Forst- u. Jagdwesen*, lxv, 10, pp. 541–544, 3 figs., 1933.

The heritability of the witches' broom habit of growth has been convincingly demonstrated in the spruce by Tubeuf [*R.A.M.*, xii, p. 664], and the writer here briefly describes his experiments in confirmation of this as regards pines with plants raised from pine cones from witches' brooms. Of the eight seedlings successfully reared, three were normal while the remainder showed the typical witches' broom development accompanied by marked stunting of the root system. The transmissibility of the witches' broom tendency from the parent tree to its progeny would thus appear to hold good for the pine as well as the spruce.

BOAS (I. H.). **The prevention of decay in building foundations.**—*Commonwealth of Australia, Council Sci. & Indus. Res., Div. Forest Prod. Trade Circ.* 18, 15 pp., 2 figs., 1933.

Directions are given in popular terms for the avoidance of decay due to dry rot in Australian structural timbers. Various fungi [unspecified] are concerned in the rotting of the wood, and general instructions are given for their control by sanitary precautions and treatment with hot creosote oil (200° F.) containing a minimum of 5 per cent. tar acids [a tentative specification for which is appended], 5 per cent. zinc chloride, or 3 per cent. sodium fluoride, the first for preference.

MACLEAN (J. D.). **Experiments with the Boulton process in the treatment of green Southern Pine poles.**—*Proc. Amer. Wood Preservers' Assoc.*, xxix, pp. 343–359, 2 figs., 1 diag., 1933.

The results [which are fully discussed and tabulated] of experiments at the Forest Products Laboratory, Madison, Wisconsin, on the treatment of loblolly [*Pinus taeda*] and longleaf [*P. palustris*] pine poles from South Carolina showed that the Boulton process [*R.A.M.*, xi, p. 815] of boiling under vacuum at 200° F. prior to impregnation with coal-tar creosote was much more effective than the steaming and vacuum method in reducing the moisture content of the poles and did not necessitate subjecting the wood to such high temperatures. The most satisfactory results were obtained when preservative temperatures of about 200° F. were used. Where heavy absorptions (over 10 lb. per cu. ft.) of preservative are required, e.g., in marine piling, the Boulton process is likely to prove

more satisfactory than the steaming process, but if it is desired to limit the retention of the preservative to less than 10 lb. per cu. ft. the latter may be preferable. Considerable difficulty was experienced in obtaining the complete penetration of sapwood, irrespective of the process used, when the net retention was limited to 10 lb. or less per cu. ft. and the timbers had an average thickness of sapwood.

RHODES (F. H.) & ERICKSON (I.). **Effect of tar acids upon the wetting of wood by coal-tar oils.**—*Indus. & Engin. Chem.*, xxv, 10, pp. 1132–1133, 1 graph, 1933.

Details are given of an experiment showing that phenols serve a useful purpose in creosote oil by facilitating the wetting of the wood (Norway spruce) [*Picea excelsa*] and increasing the stability of oil adsorption by the fibres, even though they add little to the actual fungicidal value of the oil [cf. *R.A.M.*, xiii, p. 137]. The wetting power, as indicated by the heat of wetting, is increased about 70 per cent. by the admixture of 5 per cent. phenol with the neutral oil.

KRIEG (W.) & PFLUG (H.). **Über einige Methoden zur Prüfung von Holzkonservierungsmitteln. I & II.** [On some methods for the testing of timber preservatives. I & II.]—*Chem. Zeit.*, lvii, 78, pp. 773–774; 80, pp. 794–795, 1 fig., 1933.

Technical details are given of various methods used by the writers to test the resistance of timber preservatives to leaching out.

NIELSEN (N. J.). **Forsøg med Bekaempelse af Kaalbroksvamp.** [Experiments in the control of the club root fungus.]—*Tidsskr. for Planteavl*, xxxix, 3, pp. 361–391, 1 fig., 3 graphs, 1933. [English summary.]

The results [which are fully discussed and tabulated] of ten years' experiments in the control of club root of swedes (*Plasmodiophora brassicae*) in Denmark [*R.A.M.*, xiii, p. 142] showed that two factors are of primary importance in combating the disease, namely, the maintenance of an appropriate soil reaction by applications of lime up to 18,000 kg. per hect. and a six- to eight-year system of cruciferous crop rotation. The lime appeared to be equally serviceable whether burnt lime or carbonate was used. The attack was not abated when susceptible crops (e.g., swedes) were grown as far apart as every fourth year. Some indication was obtained of the possible maintenance of infection by the agency of cruciferous weeds [ibid., xiii, p. 2].

KÜTHE (K.). **Kranke Kohlpflanzen.** [Diseased Cabbage plants.] —*Natur und Museum*, lxiii, 10, pp. 357–358, 2 figs., 1933.

A brief note is given on the occurrence of *Phoma lingam* [*R.A.M.*, xiii, p. 71] on cabbage in the Giessen district of Germany, and on the necessity of investigating various important points in connexion with the disease, e.g., the mode of transmission and varietal reaction.

NIELSEN (O.). **Forsøg med Bekaempelse af Skulpesvamp.** [Experiments in the control of the siliqua fungus.]—*Tidsskr. for Planteavl*, xxxix, 3, pp. 437–452, 3 figs., 1933. [English summary.]

Seed production in crucifers, especially white cabbage and cauliflower, is stated to be greatly reduced in Denmark by the attacks of *Alternaria brassicae* and *A. circinans* [*R.A.M.*, xiii, p. 3], which invade the siliquae and penetrate the seed besides damaging the assimilatory tissue of the leaves and stems. Infected siliquae may rupture prematurely, so that a quantity of seed is lost. The attack generally takes place shortly before harvest and spreads rapidly until the seed is removed and ripened by drying.

In a series of experiments with two to seven applications of 2 per cent. Bordeaux mixture plus 0·5 per cent. lead or calcium arsenate, the percentage of seed infection by the fungi, as judged by counts after three days in the germinator, was reduced by half and the germination increased by 9 per cent. A motor sprayer with a pressure of 10 to 20 atmospheres should be used, the addition of spreaders then being superfluous. A Bordeaux dust known as 'himmo' failed to give adequate control. Some of the seed was also treated with a mercury compound, sanagran VIII [ibid., xi, p. 162], diluted with double its weight of inert material, 1 kg. of seed being dusted with 5 gm. of the mixture. The germination of the seed was not impaired by this treatment even after a year's storage, and the percentage of *Alternaria* infection was reduced. Care should be taken not to exceed the prescribed amount of sanagran, even 7·5 gm. of which per kg. is liable to cause injury.

Good results were also obtained by stripping the leaves off the overwintered plants in the spring and removing dead material.

BLATTNÝ (C.). **Kalimangelerscheinungen bei Blumenkohl.** [Potash deficiency symptoms in Cauliflower.]—*Ernähr. der Pflanze*, xxix, 19, pp. 361–362, 1 fig., 1933. [English summary.]

In July, 1932, cauliflower plants in black clay soil, rich in humus, in western Czecho-Slovakia, showed leaf curl, interveinal chlorosis, and discoloration of the inflorescences, which were so loosely arranged that the leaves grew through them. Almost 50 per cent. of the affected stands were unmarketable. The plots had been given potash in a readily soluble form, and a deficiency of this element following excessively heavy rains and cloudbursts early in July was, therefore, suspected. This was proved to be the case by the application of potash salts (1 doppelzentner per hect.) to some cauliflower plots in which the young plants showed incipient symptoms of the condition described above, complete recovery being effected in ten days. Other kinds of cabbage showed similar manifestations of potash shortage.

DE BRUYN (HELENA L. G.). **Kwade harten van de Erwten.** [Rotten hearts of Peas.]—*Tijdschr. over Plantenziekten*, xxxix, 11, pp. 281–318, 1 pl., 1933. [English summary.]

A comprehensive, tabulated account is given of the writer's studies in Holland on the 'rotten heart' disease of peas, which has

also been reported from certain low-lying south-eastern districts of England under the name of 'marsh spot', and from Northern France as 'moucheté'. Information supplied by the Dutch Seed Testing Station indicates that the disturbance was extremely severe in 1923 and 1926 and fairly so in 1932.

No external symptoms are apparent in the affected peas. Internally, the flat inner surface of one or both cotyledons while still enclosed in the seed coats shows a brown lesion of varying extent, sometimes accompanied by partial or entire necrosis of the plumule, which may retard or prevent germination. Observations made in 1930 showed that the percentage of rotten hearts increased during the latter part of July, when the seed was approaching maturity, the number affected on the 30th being 6·94 compared with 2·03 per cent. on the 18th. The disease does not affect all the pods on a plant or all the peas in a pod; the heaviest peas were found to be the most severely damaged. Microscopic examination revealed the presence of a yellowish-brown substance in and between the necrotic cells. Neither fungi nor bacteria could be isolated from the majority of the lesions, and the writer therefore concludes that the disorder is of physiological origin. Support was lent to this view by the results of five years' manurial experiments on heavy clay soil, which showed the beneficial effects of potash (1,000 kg. per hect.) in accelerating maturity and thus indirectly reducing the damage from marsh spot. That the condition, however, is not solely due to potash deficiency is apparent from its severity on the plots receiving a complete fertilizer and on those given potash plus nitrogen, these two treatments evidently tending to delay ripening. Weather conditions no doubt also play an important part, but further investigations are required to determine its significance.

WINGARD (S. A.). **The development of rust-resistant Beans by hybridization.**—*Virginia Agric. Exper. Stat. Tech. Bull.* 51, 40 pp., 18 figs., 1933.

A fully detailed, tabulated account is given of the writer's experiments in Virginia in the development of rust- (*Uromyces appendiculatus*) resistant strains of susceptible dwarf and pole bean (*Phaseolus vulgaris*) varieties [*R.A.M.*, xii, p. 415], such as Kentucky wonder (a pole variety) and Navy (a dwarf type), by crossing these with resistant forms. Navy was crossed with Improved Godiland (also dwarf), Kentucky Wonder with Brockton Pole and Horticultural, and Powell Prolific (another susceptible variety) with Marblehead (all pole varieties). The F_1 plants of all these crosses and their reciprocals were rust-resistant, showing that resistance is dominant. In the F_2 generation segregation occurred in the closely approximate ratio of three resistant plants to one susceptible, thus showing a single factor difference for rust resistance. With a view to isolating the most desirable strains from this generation of dwarf hybrids, the white seeds of various rust-resistant F_2 individuals were planted and the offspring inoculated with rust in the greenhouse. Generally speaking, the white seed (apparently correlated with rust resistance) was the only character to breed true for several generations, but after carrying the hybrids

through some 20 generations of selections covering a period of 15 years, the writer has isolated over 30 strains of rust-resistant beans of the Navy type which breed true for all their economic characters. Similar experiments with pole beans, covering a twelve-year period, have led to the development of some 20 hybrids of the Kentucky Wonder type which breed true for rust resistance and other desirable characters.

MAGEE (C. J.). **Etiology of the chocolate spot disease of Broad Beans.**—*New South Wales Dept. of Agric. Sci. Bull.* 43, 8 pp., 2 pl., 1933.

This description of the etiology of the dark red to reddish-brown spotting of the leaves of *Vicia faba* in New South Wales, found to be due to the deposition of honeydew by aphids (chiefly *Aphis rumicis* but also *Myzus persicae*), is an expanded version of a paper already noticed from another source [*R.A.M.*, xiii, p. 143].

Legislative and administrative measures.—*Internat. Bull. of Plant Protect.*, vii, 9, pp. 202–203, 204, 1933.

GERMANY (ANHALT). By Decree of 18th April, 1933, each actual or suspected fresh outbreak of potato wart (*Synchytrium endobioticum*) must be notified to the police within 24 hours. The debris of potato crops on infected fields must be collected and destroyed by burying or burning, and no potatoes dug on such fields may be replanted (resistant varieties may be replanted but only in the same or near-by sites). Potatoes from infected fields must not be removed from the place of cultivation and may be used only if boiled or baked. Only immune varieties are allowed to be grown in communes where wart disease is known to occur, and by 1937 the gradual substitution of resistant for susceptible varieties must be completed by agricultural and horticultural concerns throughout the country. Limited areas may be declared by local authorities to be 'zones in danger of contamination', to which the above-mentioned regulations may apply. [This Decree is also published in *Amtliche Pflanzenschutzbestimmungen*, v, p. 6, 1933.]

CAMEROON (FRENCH). By a Ministerial Decree of 4th April, 1933, any planter observing the presence of *Hemileia vestatrix* in his coffee plantations is required to notify the same to the administrative authority.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, v, 3, pp. 90, 91–97, 98–104, 1933.

DUTCH EAST INDIES. An order of the Governor-General of the Dutch East Indies, dated 14th October, 1932, published in the Staatsblad on 1st November and effective as from the following day, introduces the following modification in the Order of 27th September, 1926, regulating the importation of living plants [*R.A.M.*, vi, p. 768]. The importation of *Hevea* rubber seeds from South America is permitted only under special sanction of the Director of Agriculture, Industry, and Commerce, who will consider each case on its merits. As heretofore, the importation of

living rubber plants or parts thereof from South America is prohibited.

PHILIPPINE ISLANDS. To the list of plants prohibited from entry into the Philippine Islands under Legislative Act 3027 of 8th March, 1922 [ibid., iii, p. 749], are added, by Administrative Order of the Director of Plant Industry No. 11 of 21st May, 1932 (effective as from 1st August, 1932), the Chinese yellow and red kid citrus varieties, maguey (*Agave cantala*), and sisal (*A. sisalana*). As in the case of the plants subject to previously existing restrictions, however, small quantities of the above-mentioned may be imported under certain conditions which are specified in paragraphs 2 and 10 of an Administrative Order, No. 10, of 19th March, 1932, and must be kept under quarantine in isolation until they have been shown to be free from injurious insects and parasitic fungi.

POLAND. An Order of the Polish Minister of Finance of 22nd July, 1933, introduces certain further modifications in the Customs Order of 14th March, 1930, which has already undergone partial alteration by the Orders of 12th January and 22nd February, 1932, and 11th January, 1933. Potatoes of all kinds, including those intended for seed, may be imported only if accompanied by a properly authorized certificate vouching for the freedom of the consignments (with packing) from wart disease (*Synchytrium endobioticum*) [ibid., viii, p. 664] and powdery scab (*Spongospora subterranea*), and further that no centres of the former occur within a radius of 20 km. from the place of cultivation. Certificates of health in respect of crown gall (*Bacterium tumefaciens*), *Didymella applanata* (raspberry), *Sphaerotheca mors-uvae* (gooseberry), *Pseudoperonospora humuli* and virus diseases (hops), *Pseudomonas hyacinthi* (hyacinth) [ibid., xii, p. 514], and *Septoria azaleae* (azalea) [ibid., xii, p. 696] are further required. The absence of *Synchytrium endobioticum* from the packing materials and from the locality of cultivation must also be guaranteed in the case of bulbs, tubers, roots, and rooted plants. Should infection by any of the above-mentioned pathogens be detected in the imported consignments on official inspection, admission within the Polish fiscal area will be refused in respect of such material. Plant imports unaccompanied by official health certificates will not be released for commerce before they have been inspected by Polish plant protection experts and pronounced free from infection by dangerous diseases and pests.

Legislative and administrative measures. Spain.—*Internat. Bull. of Plant Protect.*, vii, 10, pp. 231–232, 1933.

By a Decree of 17th March, 1933, any Spanish forests showing signs of deterioration in consequence of insect and fungus injuries are to be regarded as contaminated by forest pests, all matters relating to the control of which will be directly in the charge of the General Administration of Forests, Fisheries, and Game. These authorities will regulate the importation, circulation, and sale of forest seeds, plants, and products from places harbouring such pests or diseases with a view to preventing the spread of the latter. Municipalities are required to notify the General Administration

of the occurrence of any pest or disease within the forest areas under their jurisdiction, while owners or holders of forest lands must notify the municipal authorities of the presence of such infestation on their properties. Protective and control measures in public forests will be carried out entirely at the expense of the State, whereas on corporation or private lands only the technical direction, apparatus, and the like will be the affair of the State, the owners being responsible for the workmen's wages.

SMITH (H. S.), ESSIG (E. O.), FAWCETT (H. S.), PETERSON (G. M.), QUAYLE (H. J.), SMITH (R. E.), & TOLLEY (H. R.). **The efficacy and economic effects of plant quarantines in California.**— *California Agric. Exper. Stat. Bull.* 553, 276 pp., 1933.

In this report of a committee appointed by the Dean of the College of Agriculture, University of California, to study the numerous problems involved in the application of the plant quarantine system in the State, the subject is fully discussed under its biological, economic, and administrative aspects.

Among the biological considerations are the geographical distribution of plants, pests, and diseases; the probability of introduction of viable pests and diseases; and the relation between the introduction and establishment of pests and diseases. Economic factors influencing the trend of quarantine policy include the effect of pests and quarantines on total income and on its distribution among individuals and groups; the effect of changing volume and quality of products; the financial results of excluding plant pests and diseases as compared with that of excluding certain commodities; and the costs of combating pests and diseases at present in California. Under administrative aspects are comprised the need for exchange of agricultural commodities; systems of plant quarantine; the topographical and climatic features of California in relation to quarantine; a brief history of plant quarantine in California; the administration of State quarantines; and an analysis of the plant quarantines administered for the protection of California agriculture, including those against peach yellows and rosette, white pine blister rust (*Cronartium ribicola*), flag smut of wheat (*Urocystis tritici*), citrus melanose (*Diaporthe citri*) [*R.A.M.*, xiii, p. 26], citrus canker (*Bacterium* [*Pseudomonas*] *citri*), cotton, Texas, or *Ozonium* root rot (*Ozonium* [*Phymatotrichum*] *omnivorum*), chestnut bark disease (*Endothia parasitica*), potato wart (*Chrysophlyctis endobiotica*) [*Synchytrium endobioticum*], Woodgate rust of pines (*Peridermium* sp.) [ibid., xii, p. 733], hop downy mildew (*Pseudoperonospora humuli*), phony peach [ibid., xiii, p. 38], maize diseases (*Peronospora maydis* [*Sclerospora* spp.: ibid., xi, p. 546], *Physoderma zeae-maydis*, and *P. maydis*), rice diseases (*S. macrocarpa*, *Entyloma oryzae*, *Oospora oryztorum*, and *Melanomma glumarum*) [ibid., xii, p. 464], bamboo smut (*Ustilago shiraiana*) [ibid., iii, p. 751], and filbert blight (*Cryptosporella anomala*) [ibid., x, p. 347].

For the fiscal year ending 30th June, 1931, the cost of plant quarantine enforcement in California amounted to $388,144, of which the United States Department of Agriculture contributed $16,342.

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BALDACCI (E.) & BORZINI (G.). **Il mal degli sclerozi nei Fagioli.** [The sclerotial disease of Beans.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, pp. 69–86, 8 figs., 1933.

In 1932, beans [*Phaseolus vulgaris*] growing in the province of Pavia were slightly attacked just before harvesting by *Sclerotinia libertiana* [*S. sclerotiorum*]. A year later the disease reappeared on the young crop, killing many plants and necessitating resowing. The second lot of seedlings grew well until June, when a fresh attack caused considerable losses in damp places and where the plants were overcrowded. A full description of the symptoms of the disease is given, together with a summary of previous records in other countries and an account of the life-history of the fungus. The Fagiolo del Papa variety remained unaffected, while Borlotto di Vigevano was highly susceptible and Varese moderately so. The seeds of the affected plants showed reddish-brown lesions, but when infected seed was sown in reasonably dry soil and the weather during the growing period remained dry the resultant plants were healthy. It is considered that the attack in 1933 was greatly favoured by rainy weather, supplemented by inadequate drainage and excessive applications of organic fertilizers. Infection comes mainly from the sclerotia in the soil and requires soil and weather conditions favourable to their germination and growth. Inoculations in the laboratory gave positive results only on wounded pods, though healthy pods mixed with diseased ones developed characteristic sclerotia. Inoculations into the stems gave negative results. The paper terminates with brief practical notes on control, and there is a bibliography of 34 titles.

KORNFELD (A.). **Die Blattfleckenkrankheit der Soja—eine Kalimangel-Erscheinung.** [Leaf spot disease of Soy-Bean—a potash deficiency phenomenon.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, xxxii, 3-4, pp. 201–221, 6 figs., 1 graph, 1933.

Since 1930 the writer has been investigating a leaf-spot disease of the extensive soy-bean crops in Transylvania, Rumania. The external symptoms of the disorder, which is attributed to potash deficiency, include an irregular spotting and sometimes chlorosis of the foliage and precocious maturity with its concomitants of defoliation and reduction in the quantity and quality of the yield. Among the internal modifications are starch accumulations and

a feeble development of the bast of the stem, with consequent tendency to lodging. Germinative capacity and energy are reduced in the seed from affected plants, and the latter are liable to attack by *Bacterium phaseoli sojense* and *Bact. glycineum* [*R.A.M.*, v, p. 723 *et passim*].

DECOUX (L.), VAN DER WAEREN (J.), & ROLAND (G.). **La végétation de la Betterave en Belgique au cours de l'année 1932.** [The vegetation of the Beetroot in Belgium during the year 1932.]—*Publ. Inst. Belge pour l'Amélior. de la Betterave, 1933*, 6, pp. 267–284, 6 graphs, 1933.

During the warm, damp summer of 1932 fungous diseases of beets are stated to have been more prevalent in Belgium than at any time since 1915. *Phoma betae* caused heavy damage, not only in the form of 'black leg' on seedlings, but also as an agent of 'heart rot' of fodder beets [*R.A.M.*, ix, p. 152; xii, p. 2], the roots of which in a field at Jauche with alkaline soil reaction were quite hollowed out by the fungus, 70 per cent. of the crop being attacked over an area of 2 hect. Other root parasites included *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., x, p. 434], *Bacillus bussei* [ibid., vi, p. 147], one of the agents of gummosis, and *Bacterium tumefaciens*.

Leaf spot (*Cercospora beticola*) occurred in a virulent form, destroying up to 85 or 90 per cent. of the leaves in severe cases, especially in the Hesbaye district. Ordinarily this disease is of little importance in Belgium, and according to E. Marchal [ibid., xii, p. 676] there is no need for alarm since the extraordinary weather conditions promoting the epidemic are unlikely to recur frequently. Other fungi recorded on the leaves but causing relatively little injury were *Sporodesmium putrefaciens* [ibid., xiii, p. 10], *Uromyces betae*, *Ramularia betae*, and *Phyllosticta betae*.

VERPLANCKE (G.). **Les viroses de la Betterave.** [The viruses of Beetroot.]—*La Sucrerie Belge*, liii, 1, pp. 2–10; 2, pp. 22–32, 7 figs., 1 graph, 1933. [Flemish summary.]

Mosaic and yellows are stated to be the two virus diseases affecting beets in Belgium [*R.A.M.*, ix, pp. 355–6]. Four types of the former, with which the writer is mainly occupied, may be distinguished, viz., speckled, veined, marbled, and pocked (following Merkel's classification of mosaic types in the Papilionaceae) [ibid., ix, p. 121]. Cytological studies of diseased material [ibid., xii, p. 263] revealed hypoplasia of the leaf tissues; reduction of nuclear diameter in the mottled areas; expansion of the plastids which may amalgamate and undergo fatty degeneration; the presence in the mesophyll of 'X bodies', resulting from aggregation of the leucoplasts; and necrosis of the phloem, the cells of which show a thickening of the walls and contain a yellow deposit, extending to the roots in which X bodies are found in the cortical parenchyma.

Transmission was effected in 100 per cent. of the writer's tests by smearing the expressed juice of mosaic leaves on wounded healthy ones; the insects *Doralys fabae*, *Myzus persicae*, and *Aulacorthum pelargonii* gave positive results in 71 to 89 per cent of the experiments in transmission by them. No sign of 'masking'

of the symptoms was observed, although the test plants were held at temperatures exceeding 25° C.

In the writer's experiments the disease appeared in 7·1 per cent. of the plants raised from seed from mosaic mother beets; this is in agreement with Ducomet's results [ibid., vii, p. 418]. Yellows was found to be similarly transmissible to the extent of 5·7 per cent. No transmission of infection takes place through the soil, even when roots of diseased and healthy plants are in close contact; it was readily effected, however, by grafting fragments of mosaic on to healthy roots.

Forty-five species of weeds in 22 families were found to harbour the mosaic virus, while that of yellows was detected in 32 species in 19 families. Neither attenuation nor increase in virulence accompanied its passage from beets to weeds and back again. Cytological studies of mosaic material of turnip, *Rumex crispus*, chicory [*Cichorium intybus*], carrot, and broad bean [*Vicia faba*] showed the same features as those described for beet; transmission was effected to the last-named from all except *V. faba*. Field experiments indicated that beet mosaic is favoured by the use of nitrogenous fertilizers. None of the 20 sugar beet varieties under the writer's observation showed an appreciable degree of resistance to the disease, which was found to cause a considerable reduction in the sugar content of the roots.

WANTUCHOWSKI (J.). **Cercospora beticola: its influence on Beet experimentation and breeding.**—*Facts about Sugar*, xxviii, 12, pp. 455–457, 1933.

The results [which are tabulated and discussed] of experiments at the Gorka Narodowa Seed Breeding Station, Warsaw, on varietal reaction to leaf spot of beets (*Cercospora beticola*) [*R.A.M.*, xi, p. 20] showed the necessity of using a healthy standard variety for comparative purposes. Of the 240 varieties tested at the Breeding Station in 1931, 101 resisted infection better than the standard, 33 were equal to the latter in this respect, while 106 fell more or less below the standard.

GOE. **Bekämpfung der Zwiebelrotzkrankheit.** [Control of the Onion slime disease.]—*Obst- und Gemüsebau*, lxxix, 11, p. 174, 1933.

The Aschersleben [Saxony] branch of the Biological Institute is engaged on a study of the 'slime' disease of onions [*R.A.M.*, xiii, p. 5], which is particularly injurious to the second-year seed bearers. The leaves turn pale and show yellow stripes, become crinkled and limp, and finally droop down to the ground. Pending the detection of a causal organism [ibid., x, p. 329], the following are the only practicable control measures: procurement of seed from an unaffected locality; winter forcing of seed samples to ascertain the incidence of infection; choice of small bulbs; and dense planting to avoid exposure to the light.

CORBETT (W.). **Asparagus rust.**—*Fruit-Grower*, lxxvi, 1981, pp. 941–942, 1933.

The hot summer of 1933 apparently favoured a recrudescence

of asparagus rust [*Puccinia asparagi*: *R.A.M.*, xii, p. 745] in many parts of England. The disease appears to have been last recorded in England in 1897, but inquiries showed that it occurred in the Evesham district in 1899 and was severe there in 1904–6, inclusive, while one case was observed in Cambridgeshire in 1912 and another a few years ago. The symptoms of the disease are briefly described in popular terms, with a recommendation for the arrest of further attacks by one or more applications to the 'bower' of very finely divided sulphur dust at the rate of ½ cwt. per acre.

YU (T. F.). **Pathological and physiological effects of Bacillus tracheiphilus E. F. Smith on species of Cucurbitaceae.**—*Nanking Coll. of Agric. & Forestry Bull.* 5 (New Series), 72 pp., 10 pl., 3 graphs, 1933.

A comprehensive, fully tabulated account is given of the writer's studies, at Nanking, China, covering a period of three years, on the physiology of *Bacillus tracheiphilus* [*R.A.M.*, xi, p. 428], the process of wilting in cucumbers associated with its presence, and varietal reaction to the organism amongst the Cucurbitaceae.

B. tracheiphilus was found to be capable of utilizing dextrose, levulose, galactose, mannose, mannite, lactose, sucrose, raffinose, glycerine, dextrin, inulin, and starch, with the production of acid but no gas. It was unable to use nitrogen from inorganic nitrogenous compounds or from several amino-acids. In beef bouillon it grew best between P_H 6·75 and 7·6 at 28° C., but was short-lived. The organism, which enters the host (Chinese Long cucumbers in these experiments) through the spiral vessels in wound infections, migrates from one vascular bundle to another at the sites of anastomoses at the union of midrib and petiole and in the nodes. The daily transpiration rate was found to decrease with the progress of wilting in the plants, the development of which is assigned in part to physiological changes accompanying the dissolution of the xylem tissue by the bacteria, and in part to the plugging of the vessels. No toxic action could be determined.

Inoculation experiments on 119 varieties or selections of cucumbers, 111 of cantaloupe, 21 of squashes (*Cucurbita moschata* and *C. maxima*), and 16 of vegetable marrow (*C. pepo*) showed that these plants are susceptible to *B. tracheiphilus* in the order named, the American varieties being generally more resistant than the Oriental ones. Under field conditions, however, these positions were largely reversed, presumably owing to the preference of the beetles *Diabrotica vittata* and *D. duodecimpunctata*, which aid in its dissemination [ibid., i, p. 327; x, p. 500], for the American varieties.

BROWN (J. G.) & EVANS (M. M.). **A Phytophthora rot of Watermelon.**—*Arizona Agric. Exper. Stat. Tech. Bull.* 51, pp. 45–64, 4 pl., 1933.

Iowa Belle watermelons in the vicinity of Tucson, Arizona, were attacked in 1932 by a rot confined to the fruits and characterized at first by brown specks, 2 to 4 mm. in diameter, enlarging to form alternate brown and pale concentric rings, surrounded in the late stages by a rather light pinkish-buff, downy band consisting of the

conidiophores and conidia of a species of *Phytophthora*, outside which there is finally a ring of a dark ivy-green to blister-brown colour. The expansion of the spots was sometimes accompanied by cracking of the centres, while the internal tissues developed a soggy, water-soaked consistency coinciding with the advance of the fungus in the fruit tissues which was found to occur at the rate of 107 mm. in ten days. No resistance to infection was shown by any of the tissues.

The conidiophores and sporangiophores of the fungus, which was isolated from the diseased melons and grew well on a medium of autoclaved mixed grains, are simple on the host but loosely branched in culture. The typically citriform conidia, with or without a papilla, measure on an average 37·2 by 23·9 μ and may either liberate zoospores (sometimes into a vesicle) or germinate by one or more germ-tubes. Two types of sphaeroconidia [ibid., ii, p. 182] were observed—one in the sporangial phase of culture, hyaline to straw-coloured, germinating like conidia, while the other was abundant among the sexual organs, resembling oogonia in size and colour, and often forming multiple internal spores. The subspherical to piriform, mostly terminal oogonia are formed in profusion on oatmeal and maize meal agar and measure 40·6 by 34·9 μ. Only one mature oospore was observed. The antheridia are paragynous, clavate, or short and irregularly rounded. From these characters the fungus would appear to be referable to *P. cactorum* [*R.A.M.*, x, p. 754], though the oogonial dimensions are larger than those given for the latter species. Considerable details of the cytology of the fungus are given.

Inoculation experiments with the watermelon fungus gave positive results on green and ripe watermelons and tomatoes, ripe apple, pear, and orange fruits, green Bell pepper [*Capsicum annuum*] and cucumber fruits, leaves of *Agave americana* var. *marginata*, and stems of tomato and *Cereus schottii*.

Some diseases and pests of cultivated Mushrooms.—Pamphlet issued by W. Darlington & Sons, Ltd., Worthing, Sussex, 23 pp., 10 figs., 1932. [Received January, 1934.]

In this pamphlet, dealing mainly with the insect pests of cultivated mushrooms (*Agaricus* [*Psalliota*] *campestris*), short notes are given on the cause and control of plaster mould (*Oospora fimicola*), mushroom-bed sclerotium (*Xylaria vaporaria*), and 'bubbles' or 'weeping disease' (*Mycogone perniciosa*), all of which, together with *Cephalosporium costantinii*, *C. lamellaecola*, *Verticillium* sp., and *Pseudomonas tolaasii*, have been reported from Great Britain [*R.A.M.*, xii, p. 72].

JÖHNSSEN (A.). **Über die Reisigkrankheit der Rebe.** [On the twig disease of the Vine.]—Reprinted from *Der Deutsche Weinbau*, *1933*, 17–20, 10 pp., 10 figs., 1933.

The writer's observations and experiments [which are fully described] on the 'reisigkrankheit' of vines [*R.A.M.*, ix, p. 83] in the Ahr district of Germany, the most prominent symptoms of which are the dwarfing and zigzag formation of the shoots, with short, thin internodes, swollen lower nodes, small, crowded leaves,

small berries, and irregular tendril formation, are regarded as fully confirming the virus origin of the disorder [cf. ibid., xii, p. 419; xiii, p. 170]. Neither vegetable nor insect pests have been found associated with diseased vines, while the essential features of the 'reisigkrankheit' are analogous with those of certain recognized virus disturbances. The disease is considered to be due to the same cause as roncet, court noué, and leaf curl (arricciamento) in other countries. It was experimentally shown by the writer in the greenhouse and in the field that the condition is transmissible in the Spätburgunder variety through the soil, by contact of the roots, and by grafting. Spread from plant to plant takes place, but the exact means by which this occurs is not known. In American vines the early symptoms are less marked than in the European varieties. 'Reisigkrankheit' is characterized microscopically by the development in the vessels of 'cordons endocellulaires' [ibid., vii, p. 556; xi, p. 21], these being the most reliable diagnostic character.

BRANAS (J.) & DULAC (J.). **Sur le mode d'action des bouillies cupriques au moment de leur emploi.** [On the mode of action of copper mixtures at the moment of their use.]—*Comptes rendus Acad. des Sciences*, cxcvii, 17, pp. 938–941, 1933.

Starting from the hypothesis that the toxicity of a copper mixture to *Plasmopara viticola* depends on its content of dissolved copper irrespective of the nature of the copper compounds [*R.A.M.*, xii, p. 674], the writers ascertained by laboratory tests [details of which are given] that there is a sufficiency of dissolved copper in 2 per cent. Burgundy and Bordeaux mixtures whether of acid, neutral, or alkaline reaction (at least $\frac{1}{20,000}$) to afford absolute protection at the moment of use. The solubility of the compounds after desiccation and that of the deposits on the leaves is another question.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom. 1931–1932.—395 pp., London, H.M. Stationery Office, 1933.

In this compilation (prepared on the same lines as that of the preceding year) [*R.A.M.*, xii, p. 139] a greatly condensed account is included of the phytopathological work carried out at the various research stations, the laboratories of the Ministries of Agriculture for England and Northern Ireland, and the Department of Agriculture for Scotland, as well as of the local investigations at advisory centres throughout the United Kingdom. Most of the information in question has already been noticed in this *Review* from other sources.

SIMMONDS (J. H.). **The work of the Pathological Branch.**—*Ann. Rept. Queensland Dept. of Agric. & Stock for the year 1932–3*, pp. 61–63, 1933.

During the period under review disease was a major factor in influencing the development of the tobacco industry in Queensland. In the southern parts of the State blue mould [*Peronospora taba-*

cina: *R.A.M.*, xiii, p. 132] was by far the most serious disease of this crop, planting frequently being greatly delayed owing to the loss of seedlings. In northern localities frog-eye (*Cercospora nicotianae*) [ibid., xii, p. 794] was of greater importance, and owing to exceptionally wet weather reached epidemic proportions, the damage caused being particularly noticeable during curing.

Evidence was obtained that banana speckle [ibid., xii, p. 457], hitherto regarded as of minor importance, is capable of causing even greater loss of leaf than leaf spot (*C. musae*) [ibid., xii, p. 456].

It was ascertained that both brown and black spot [*Colletotrichum gloeosporioides* and *Phoma citricarpa*, respectively: ibid., x, p. 161; xii, p. 335] of Emperor mandarins [*Citrus nobilis* var. *deliciosa*] may be controlled by spraying with Bordeaux mixture (3–2–40).

An extensive series of field plots was laid down to obtain further information on the effect of soil conditions on pineapple wilt [ibid., xii, p. 520].

From a serious disease of papaw referred to as 'black fruit spot and stem canker' and attributed partly to an exceptionally cold winter a fungus [unnamed] was isolated, the pathogenicity of which was established. In parts of Southern Queensland the winter is sufficiently cold to kill the lower leaves of susceptible varieties and produce scalding of the exposed surface of the fruit. The fungus was able to set up infection through the injured tissue, producing a large, black, sunken spot on the fruit and causing the leaf stalk to decay. It sometimes spread back into the main stem and caused a serious canker.

Black root of beetroot (*Nematosporangium* [*Pythium*] *aphanidermatum*) [ibid., x, p. 768] and downy mildew of lettuce (*Bremia lactucae*) were recorded for the first time in Queensland.

Young hoop pines [*Araucaria cunninghamii*] were killed by a seedling blight and stem rot frequently associated with a *Fusicoccum* and a *Diplodia*.

PATEL (M. K.). **India: diseases in the Bombay Presidency.**—*Internat. Bull. of Plant Protect.*, vii, 11, p. 246, 1933.

Septoria cannabis [*R.A.M.*, viii, p. 199] is recorded for the first time in the Bombay Presidency on hemp (*Cannabis sativa*). *Uromyces fabae* [ibid., xii, p. 596] and *Erysiphe polygoni* [ibid., xi, p. 224] are stated to be causing heavy damage to sweet peas in the Poona district, this being their first reported occurrence in India on the host in question.

THOMPSON (A.). **Division of Mycology. Annual Report for 1932.**—*Dept. of Agric. Straits Settlements and Fed. Malay States* (*Reports of the Res., Econ., and Agric. Educ. Branches for the year 1932*) *Bull. 14, Gen. Ser.*, pp. 53–62, 1933.

In 1932, at the Experimental Station, Serdang, stem rot of oil palms (*Fomes noxius*) [*R.A.M.*, xii, p. 354] produced the highest percentage of infection in a block of poorly developed palms on a clay soil overlying a hard pan. It has not yet been possible to determine how long elapses under average estate conditions between the onset of stem infection and the death of the palm. *F. noxius*

was found on a leaf base with a mottled brown and white decay that had not reached the stem tissue, its fruit bodies being evidently produced sometimes at the beginning as well as at the end of an attack on the palm. Two infections were examined in which the bases of the palms were covered with the fructifications of *F. lignosus*; the mycelium was growing on the roots, but had not penetrated the tissues.

Tea diseases recorded from the Cameron Highlands included red root disease (*Poria hypolateritia*), red rust (*Cephaleuros parasiticus*), brown blight (*Colletotrichum camelliae*) [*Glomerella cingulata*], and leaf spot (*Cercosporella theae*) [ibid., vii, p. 746]. In the same locality die-back of Arabica coffee occurred unaccompanied by leaf disease (*Hemileia vastatrix*), in some cases extending to the larger branches; a *Colletotrichum* was found in profusion on the dying twigs. The most serious disease of tobacco was *Bacterium solanacearum* [ibid., xi, p. 769; xii, p. 355], which on some smallholdings where tobacco had previously been grown caused losses ranging from 10 to 80 per cent. of the crop. The presence of brown rot of potatoes caused by *Bact. solanacearum* in the Cameron Highlands was confirmed. On newly opened, uncleared land *F. lignosus* caused serious damage to pepper [*Piper nigrum*]. A *Collybia* was isolated from *Shorea leprosula* seedlings attacked at soil level by a white mycelium resembling thread blight which encircled the stem and spread upwards by means of thin rhizomorphs; the hyphae penetrated into the base of the stem, causing a dry rot of the wood and killing the plants. The fructifications of the fungus, which developed on material kept in a damp chamber, were small, the cap being about 0·5 cm. in diameter, orange-brown, later white and transparent, while the white, slender stalk averaged 0·5 in. long. Powdery mildew of pumpkin leaves was recorded, perithecia of *Erysiphe cichoracearum* [ibid., vi, p. 716] accompanying the conidial stage.

Other records included a *Diplodia* causing collar rot and death of avocado seedlings following the sudden removal of overhead shade, *Sphaerostilbe repens* attacking the roots of the same host, with fatal results, and *Phytophthora parasitica* causing wilting of roselle fibre plants [*Hibiscus sabdariffa*].

In further investigations into the bacteria and moulds causing deterioration of copra [cf. ibid., xii, p. 355] inoculation tests showed that the greatest amount of injury was produced when bacteria and *Aspergillus flavus* [ibid., ix, p. 177; xi, p. 175] were used together.

LEACH (R.). **Report of the Mycologist for 1932.**—*Ann. Rept. Dept. of Agric., Nyasaland, 1932*, pp. 53–54, 1933.

The following information, apart from that already noticed from other sources, is contained in this report. A species of *Rhizoctonia* closely allied to *R.* [*Corticium*] *solani* was isolated from tea seedlings raised from valuable imported seed, on which black lesions were formed at the stem bases, partially or entirely girdling them and generally killing the young shoots. *Armillaria mellea* was found on one estate to be killing the green manure plant, *Tephrosia candida*, from which it had evidently spread to the tea.

Experiments on cowpea (*Vigna* sp.) showed that in plots receiving sodium sulphate in addition to nitrophoska the number of root nodules produced was about ten times as high as in those without sulphur. The leaves were also larger and more numerous in the sulphate-treated plots. These observations are of interest in relation to the etiology of tea yellows [*R.A.M.*, xii, p. 537].

McDonald (J.). **Annual Report of the Senior Mycologist for 1932.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1932*, pp. 124–134, 1933.

Field observations during 1932 lent weight to the theory that severe attacks of the coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xii, p. 8] in certain areas may be associated with excessive or unbalanced supplies of nitrogen. For two seasons the Blue Mountain variety has remained practically free from infection.

The physiologic form K4 of wheat black rust (*Puccinia graminis tritici*) [ibid., xii, p. 13] appears to be distinct from all those known in other parts of the world. A sample of black rust from Iringa, Tanganyika Territory, was found to be identical with form K3, already known in Kenya. In a collection of rusted barberry (*Berberis holstii*) leaves made in April, a teleutospore stage was found developing in some of the uredo pustules; the rust forms now recorded on this host in Kenya are two types of aecidia, with one of which pycnidia are associated, uredo- and teleutospore pustules. Negative results were given by inoculation tests on wheat by the aecidiospores from barberry.

C. A. Thorold reports that take-all of wheat (*Ophiobolus graminis*) [ibid., xii, p. 9] is a limiting factor in production at the higher altitudes (from 7,500 ft. upwards). Since the fungus cannot long persist in the soil in the absence of cereals or grasses, the adoption of a suitable rotation or clean fallow system should afford control [ibid., xiii, p. 87].

A species of *Fusarium* was shown by inoculations to be responsible for a destructive wilt of groundnuts on the coast, the infected plants collapsing suddenly after 16 to 30 days while the uninoculated controls remained healthy. The fungus was reisolated from four of the five inoculated plants.

Investigations were also carried out on bacterial blight of beans [*Phaseolus vulgaris*], probably due to *Bacterium medicaginis* var. *phaseolicola* [ibid., xii, p. 9], and on linseed rust (*Melampsora lini*), a new disease for the Colony.

A year's progress in solving farm problems of Illinois 1932–33. Forty-sixth Annual Report for year ended June 30, 1933.—295 pp., 24 figs., 11 diags., 7 graphs, 1933.

The following are among the items of phytopathological interest (some of which have already been noticed from other sources) scattered through this report. The average annual maize crop during the past ten years is estimated at 321,788,400 bushels, of which one-fourth is destroyed by disease before harvesting, representing a loss of almost 80½ million bushels or nearly 18 million dollars even at the low price of 22 cents per bushel prevailing in 1932. Careful selection of seed reduced the losses from ear rots

(*Diplodia zeae*, *Fusarium* [*Gibberella moniliformis* and *G. saubinetii*], and *Basisporium* [*gallarum*: *Nigrospora* spp.]), and improved the yield by an average of 12 per cent. in five years' experiments with the Reid Yellow Dent variety by B. Koehler [*R.A.M.*, viii, p. 292; xii, p. 12]. Preliminary observations indicated that maize infested by *D. zeae* was less palatable to pigs than sound grain.

Studies by E. W. Lehmann, R. H. Reed, H. W. Anderson, and R. L. McMunn showed the cost of operation of a stationary spraying plant to be 25 to 65 per cent. below that of a portable plant, dependent on the number of laterals and outlets installed. The time required to move from one tree to the next was increased by 7¼ to 13½ per cent. by extending the group of trees perpendicular to the pipe line, e.g., by 7 to 9 or 5 to 7. In the spring of 1933 the owners of stationary plants were able to apply the regular spraying programme, while those employing portable systems were prevented by the frequent heavy showers.

Apple measles [ibid., xii, p. 749] has been observed by H. W. Anderson to be most prevalent in orchards on tight clay types of soil of the grey silt-loam region; there is some indication that the disease may be combated by the excision of affected branches, liming of the soil, and planting legumes to provide nitrogen and humus. For the present it is inadvisable to plant Delicious and its red sports in the grey silt-loam region owing to their susceptibility to measles.

A Pythiaceous fungus causes a destructive root rot of strawberries, which has been found by H. W. Anderson and A. S. Colby in Vermilion County to be prevalent on heavy clay soils. Abundant oospores were found in the root tissues, but attempts to culture the fungus proved unsuccessful, nor did healthy plants contract the disease when grown in contaminated soil in the greenhouse. It appears, therefore, that the fungus only assumes a virulent form in soils with a high water-holding capacity.

A new tomato variety, Century, developed by W. A. Huelsen and W. H. Michaels, is stated to compare very favourably with Marglobe as regards resistance to *Fusarium* [*lycopersici*: ibid., xii, p. 12; xiii, p. 194]. In total-average production of U.S. Cannery Nos. 1 and 2 grades in 1932 Century outyielded Marglobe by 9·78 per cent.

Tu (C.). **Notes on diseases of economic plants in South China.**—*Lingnan Sci. Journ.*, Canton, China, xi, 4, pp. 489–504, 10 pl., 1933.

Since 1930 the writer has been engaged on a survey of the diseases affecting economic crops in South China, some preliminary notes on the more important of which are here given. Amongst the diseases recorded the following may be mentioned. Cabbage in the Canton district suffers heavy damage from a *Sclerotinia* [? *sclerotiorum*: *R.A.M.*, x, p. 118], recognizable by the flocculent, white aerial mycelium and large black sclerotia on the surface or embedded in the host tissues. The yield may be reduced by 20 per cent. or more. Yellows (*Fusarium conglutinans*) also occurs in a mild form on the same host.

The recently introduced varieties of papaw have been found

extremely susceptible to anthracnose (*Gloeosporium papayae*) [ibid., xi, p. 223].

A chilli variety is affected by leaf curl [ibid., xi, p. 781], characterized by downward curling, pallor, stunting, and extreme brittleness of the upper foliage.

The severity of black spot of oranges (*Phoma citricarpa*) [see above, p. 215] is stated to be steadily increasing, especially on mandarins. Scab (*Sphaceloma fawcettii*) has been found coextensive with Chinese lemon (*Citrus limonia*) cultivation [ibid., xii, p. 626], the young leaves, twigs, and fruits being commonly attacked. All the citrange [*C. sinensis* × *Poncirus trifoliata*] varieties are also highly susceptible in the juvenile stage, whereas sweet and mandarin oranges show a high degree of resistance to this disease.

Most Japanese mulberry varieties at the Department of Sericulture are affected by mosaic [cf. ibid., x, p. 398], characterized by typical mottling and in severe cases by extensive crinkling and stunting.

Septoria pyricola [ibid., xi, p. 267 ; xiii, p. 76] occurs in a severe form on native sand pears [*Pyrus serotina*: ibid., v, p. 107], which are also liable to a mild type of fireblight (*Bacillus amylovorus*) [cf. ibid., x, p. 644].

The Khapli, Marquillo, and native wheat varieties are severely attacked by *Sclerotium rolfsii* [ibid., viii, p. 34].

Heavy damage is inflicted on Chinese olives (*Canarium album*) by a gall closely resembling the crown gall due to *Bacterium tumefaciens*.

HEUBEL (G. A.). **Het voorkomen en ontstaan von stikstofknobbeltjes in de bladeren van verschillende Rubiaceeën en de eventueele beteekenis daarvan voor de cultures.** [The occurrence and origin of nitrogen nodules in the leaves of various Rubiaceae and their potential importance for cultivation.]—*De Bergcultures*, vii, 45, pp. 1246–1249, 3 figs., 1933.

In the annual report for 1932 of the Malakka Experiment Station the cultivation of shrubby Rubiaceae as green manures in rubber plantations is recommended, presumably on account of the nitrogen-fixing bacteria contained in the leaves of many species, e.g., of *Pavetta* (including *P. indica*) and *Psychotria* (*P. bacteriophila*) [*R.A.M.*, vii, p. 799]. Von Faber's investigations (*Jahrb. Wiss. Bot.*, 1912 and 1914) showed that the leaf buds of such plants exude a foamy mass containing rod-shaped bacteria (*Mycobacterium rubiacearum*) which penetrate the young, furled leaves through stomata or other apertures and dissolve the cell-walls to form cavities. In this respect the organism behaves as a true parasite to which the plant reacts by the secretion of an antitoxin and the formation of a semi-impenetrable barrier whereby the bacterial colonies are isolated. New cells rapidly grow out into the cavity and the multiplication of the organism in the newly formed tissue which constitutes the visible nodule no longer adversely affects the host, the association, on the contrary, benefiting both partners.

Bacterium-free plants, raised from seed sterilized by immersion for 25 minutes in water at 50° C., showed a considerable reduction of germinative capacity and vigour compared with those grown

from 'infected' seed. *M. rubiacearum* originates in the seed and is conveyed from the growing point into the leaves and flower buds, whence it passes into the embryo sac of the ovules and so back into the seed. Fresh inoculation from the soil, as required in the case of the Leguminosae, is therefore superfluous with the Rubiaceous symbionts. So closely interdependent are the latter and their hosts that the bacteria are unable to survive the death of the plants.

Von Faber's experiments showed that *M. rubiacearum*, growing on a non-nitrogenous medium, is able to fix considerable quantities of nitrogen from the atmosphere. It was also found that bacterium-free plants were unable to grow in sand and water cultures without nitrogen, whereas those containing bacteria made satisfactory progress. Probably the use of Rubiaceous plants on Java rubber estates would be equally advantageous with that of the commonly cultivated Leguminosae.

FAULKNER (O. T.). **Black pod disease of Cacao.**—*Rept. Agric. Dept. Nigeria for the year 1932*, pp. 32–34, 1933.

A series of four experiments is in progress near Ibadan to determine the efficacy of various control measures against black pod disease [*Phytophthora palmivora*: *R.A.M.*, ix, p. 166] on native cacao farms in Nigeria. One part of each plot has been left untouched as a control, while the other was thinned and pruned at the beginning of the trials in 1931. The thinned and pruned part of each plot further received one or other of the following additional treatments: three applications during the year of Bordeaux mixture, dusting with a copper dust, dusting with finely divided sulphur, or 'thorough sanitation', comprising the burying of all husks and diseased pods, and branches. In 1932–3 the percentages of infection in the plots receiving each of these treatments were 2, 2·6, 3·1, and 5·5, respectively, the corresponding figures for the controls being 10·8, 5·4, 10·3, and 4·7. The district under observation is stated to be thoroughly infested by black pod, so that these figures give a fairly correct idea of the extent of the disease. But for the frequent harvesting of the crop, which is one of the most effective measures against black pod, the losses from the disease would have ranged from 4 to 12·5 per cent. in different years and fields. In 1932–3 the yield from the Bordeaux treated half of the plot was 856 lb. of dry cacao per acre as compared with 523 lb. for the control portion, the corresponding figures for the copper and sulphur dusts and thorough sanitation treatments being 745 (907), 1,216 (1,160), and 750 (630), respectively.

KADEN (O. F.). **Untersuchungsergebnisse über nichtparasitäre Kakaokrankheiten in San Tomé und Principe.** [Results of investigations on non-parasitic Cacao diseases in St. Thomas and Prince's Islands.]—*Der Tropenpflanzer*, xxxvi, 8, pp. 321–340, 1933.

The first extensive outbreaks of the so-called 'morte subita' or 'plethora' disease of cacao in St. Thomas Island, Gulf of Guinea, are stated to date from the period between 1921 and 1925 when

the plantations were devastated by thrips (*Heliothrips rubrocinctus*). A temporary cessation was followed by a renewal of the epidemic in 1927. Some idea of the extent of the losses may be given by the numbers of deaths, estimated at 55,000 trees in a single plantation in 1925 and at over 70,000 in another during the last three years. The leaves of apparently vigorous trees suddenly assume a limp, glassy appearance, turn yellow within a few hours, and generally die in two or three days. A temporary recovery may occasionally be effected by drastic pruning to stimulate new growth, supplemented by the application to the soil of 5 per cent. iron sulphate. The withered leaves emit an odour of ripe apples on crumbling in the hand. No trace of parasitic agency has been detected, though the finer absorbing roots of affected trees are desiccated. The disease is most prevalent in the yellow Brazilian Amelonado (St. Thomas Criolla) plantings of eight years old and upwards, the red Central American varieties and their hybrids being relatively resistant. 'Morte subita' is confined to the compact soils (mostly red loam) of the interior and south of the island, reaching its climax at the beginning of the dry season (June to August).

Discussing the etiology of 'morte subita' the writer draws attention to the gradual modification of the insular climate, largely under the influence of the excessive deforestation and drainage of swamps to meet planting requirements. Formerly enjoying a temperate moist warmth throughout the year, the island is now subject to sharply fluctuating extremes of temperature and humidity to which cacao is naturally sensitive. The importance of this factor in the causation of 'morte subita' is suggested by its complete absence from Prince's Island until 1929, when large forest areas were cleared and the climatic conditions underwent the changes described above; at this time the first cases of the disease were recorded. Another underlying cause of the apparently 'sudden' death of the trees is aluminium poisoning resulting from the poverty of the soils in exchangeable lime. Suggestions are made for combating the disease by systematic reafforestation, thorough soil sanitation, fertilizing with lime, organic manure, and compost, green manuring (e.g., with *Crotalaria retusa*), adequate shade provision, deep planting, and the use of resistant Venezuelan varieties.

'Mela' (yellow fruit) is stated to have increased steadily during the past decade, ruining the harvest prospects of the last two years. The fruits may reach a length of 12 cm. before shrivelling from the tip downwards. Like the foregoing disease, 'mela' appears to be primarily a sequel to abrupt climatic changes, and in the writer's opinion the associated fungi (e.g., *Lasiodiplodia* [*Botryodiplodia*] *theobromae* and *Colletotrichum luxificum*) [*R.A.M.*, v, p. 149] are purely secondary. This trouble, which occurs even in the superior soils in the north of St. Thomas, may be largely prevented by the establishment of windbreaks and the application to the soil of wood ash and potash salts. Similar causes and remedies are operative in the cases of precocity and hardening of the fruit, which are prevalent in both islands during the June to October monsoon and give rise to defective beans after fermentation. In

new plantations the Angoleta and Cundeamor varieties should replace the locally grown Amelonado.

Nanism is another condition of recent development in which the affected trees fail to attain more than 1 m. in height; the shoots remain slender and early turn brown, leaves, fruits, and seeds are abnormally small, and flowers scanty. In the deforested regions of Prince's Island the occurrence of dwarf trees is general. As early as 1907 C. Gravier drew attention to the gradual dying-off of old cacao trees in the north of St. Thomas (*Bull. Mus. Hist. Nat.*, p. 213), which presents analogies with the die-back described by Fernandes and van Dijk from Surinam [*R.A.M.*, vi, p. 603]. Secondary parasites on affected trees include *B. theobromae*, *C. luxificum*, and *Cephaleuros virescens* [*C. mycoidea*: ibid., ix, p. 632]. The sole cure for these disorders is the restoration to the trees of the essential conditions of growth—good soil, humidity, shade, and protection from wind.

BURTON (G. J. L.) & LATHBURY (R. J.). **Annual Report of the Senior Plant Breeder for 1932.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1932*, pp. 141–148, 1933.

Apart from take-all [*Ophiobolus graminis*: see above, p. 217], wheat diseases were not specially prevalent in Kenya during the period under review.

Cross No. 112, the parents of which are a Njoro wheat and an English hybrid, proved resistant to form K4 of black rust [*Puccinia graminis tritici*: loc. cit.], though succumbing to a severe epidemic of form K2 at Mau Summit. This cross was also resistant to yellow rust [*P. glumarum*] at 8,500 ft. So far Cross No. 130 (Njoro × a selection of Australian Florence) has been exposed only to forms K1 and K4 of black rust, with promising results. Both the parents are resistant to *P. glumarum*. Cross No. 131 (Njoro × Florence) has proved highly resistant to form K1 and (in the F_3 generation) to K2 of *P. graminis tritici*, as well as to yellow rust [cf. *R.A.M.*, xii, p. 13]. These encouraging results give ground for hope that the present danger from rust may shortly be eliminated to a great extent in the Colony.

Maize breeding with a view to the development of resistance to white blight (*Helminthosporium turcicum*), *Fusarium* rots [loc. cit.], and rust [*P. maydis*] is in progress under the supervision of C. Maher in the Trans Nzoia. A considerable advance has already been made in respect of the first-named disease, but the *Fusarium* rots still present a complex problem.

REMSBERG (RUTH) & HUNGERFORD (C. W.). **Certain Sclerotium diseases of grains and grasses.**—*Phytopath.*, xxiii, 11, pp. 863–874, 4 figs., 1933.

'Snow scald' is the name proposed by the writers for the disease first observed in the Idaho wheat fields in 1922 [*R.A.M.*, iii, p. 267] as being appropriate to the scalded appearance of the plants. It has recurred annually in the same region since, and in the spring of 1931 the damage it caused in the experimental wheat and barley

plots at the Sandpoint Substation ranged from 5 to 85 per cent., the yield in some cases being reduced by 75 per cent. In each of the years 1922, 1926, 1929, and 1932 the injury from snow scald necessitated the re-sowing of winter wheat over hundreds or even thousands of acres.

Isolations from ten collections of snow-scalded wheat, barley, and grasses yielded 14 sclerotial fungi, which can be placed in four groups according to their morphological and physiological characters [ibid., xii, p. 367]. The sclerotia of group I (wheat and unspecified material) germinate rapidly and profusely and range from 0·1 to 2 mm. in diameter; they are light brown to black at maturity, devoid of a rind, spherical to oval, and smooth. Those comprising group II (wheat, barley in Idaho and Japan, and an unspecified grass in New York) are dark brown, spherical to irregular, rough or smooth, devoid of a rind, 0·9 to 4 mm. in diameter, and present an agglomerated appearance owing to their relatively slow formation. The sclerotia of group III were obtained from wheat, timothy [*Phleum pratense*], and foxtail grass (*Alopecurus fulvus*) in Japan, and from an unspecified grass, *Dactylis glomerata*, and barley in Idaho; they frequently coalesce into large, spongy masses and are reddish-brown with a tough rind at maturity, rounded to irregular, superficially rough, and measure 1·1 by 1·5 to 2 by 4 mm. in diameter. In group IV, represented by only one culture from wheat in Idaho, the sclerotia are black, with a heavy black rind surrounding a white medullary area, and measure 4 by 5 to 6 by 10 mm. in diameter. The optimum temperatures for sclerotial growth in groups I, II, III, and IV were found to be 10°, 5°, 0° to 5°, and 5° C., respectively; from 10° to 20° there was a marked decline and above 25° development was entirely arrested. Definite classification of the organisms is impossible pending the establishment of the complete life-cycle, but those belonging to group III are tentatively referred to *Typhula graminum*.

SCHMIDT (E.) & TORNOW (E[LISABETH]). **Vereinfachte Methode zum Nachweis des Quecksilbers und der Beizung von Getreide mit Quecksilber- und Kupfersalzen.** [A simplified method for the detection of mercury and of the treatment of seed-grain with mercury and copper salts.]—*Prakt. Blätter für Pflanzenbau u. Pflanzenschutz*, xi, 8, pp. 177–183, 1933.

The writers' electrolytic method for the determination of mercury in disinfectant preparations and in treated seed-grain [*R.A.M.*, xii, p. 305] has been simplified by the immersion for ¼ to 2 minutes of a thin strip of aluminium in a boiling solution of 25 per cent. thiosulphate containing 5 per cent. potash lye. In the presence of mercury the oxidation of the aluminium will be completed within the period mentioned. Copper may be similarly detected by a black deposit of copper sulphide on the sides of the test-tube and on the aluminium, as well as by the black or grey colour of the scum.

KREBS (J.). **Der Einfluss der Bodentemperatur auf die Infektion von Weizenkeimlingen durch Ophiobolus graminis Sacc., dem Erreger der Schwarzbeinigkeit.** [The influence of soil

temperature on infection of Wheat seedlings by *Ophiobolus graminis* Sacc., the agent of blackleg.]—*Schweiz. Landw. Monatshefte, 1933*, 11, pp. 285–291, 8 figs., 1 graph, 1933.

Using two physiologically distinct strains (A and B) of *Ophiobolus graminis*, the writer carried out a series of inoculation experiments under controlled conditions at Zürich on Heine's Kolben summer wheat at 14 soil temperatures ranging from 3° to 42° C. The two strains reacted differently to the influence of soil temperature, infection by A being readily obtained at a range from 9° to 24° with an optimum between 12° and 15°, the corresponding figures for B being 18° to 27° (24°). Control should be based on late sowing of winter wheat and early sowing of the summer crop. *O. graminis* has not yet assumed such serious proportions in Switzerland as in Germany [*R.A.M.*, xiii, p. 154], but may fairly often be observed in conjunction with the other agents of foot rot, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, and *Calonectria graminicola*.

KINGSLEY (EUNICE L.). **The relation of certain morphological characters of the host and fungus to the identification of the loose and covered smuts of Oats.**—*Trans. Kansas Acad. Sci.*, xxvi, pp. 98–104, 1933.

After pointing out that loose smut (*Ustilago avenae*) and covered smut (*U. levis*) [*U. kolleri*] of oats are not readily distinguishable by the characteristics of the smutted panicles alone and that the two cannot be separated without examination of the spores for the presence or absence of echinulations, the author states that herbarium material is apparently often wrongly determined. A very thin, whitish membrane over the spore masses is almost always present in *U. kolleri* and absent in *U. avenae*, and is regarded as a very important diagnostic character. The amount of visible smut present or the proportion of the glumes affected is not a reliable indication of the species concerned. The smut on some panicles probably results from infection by a hybrid of both species [cf. *R.A.M.*, xii, p. 622], as shown by the intermediate characters of the symptoms on the smutted panicles and of the spores.

In the southern part of the Great Plains *U. avenae* (to which Kanota and Fulghum oats in this locality are highly susceptible) appears to be the more prevalent species, collections from Kansas, Oklahoma, and Texas largely consisting of it.

SANFORD (G. B.). **A preliminary note on an unreported rootrot of Oats.**—*Scient. Agric.*, xiv, 1, pp. 50–51, 1 pl., 1933. [French summary on p. 53.]

A brief description is given of a serious root rot of oats which developed over a wide area in the Edmonton district of Alberta in 1933, and the symptoms of which were most marked on plants from four to eight weeks old. The lower leaves of the affected plants drooped, turned light brown to reddish, and slowly withered, while the plants assumed an upright habit, and were more or less stunted and chlorotic according to the severity of attack. The

plants tended to recover as the crown roots developed, but the size and number of spikelets produced was definitely reduced, and the diseased plants had commonly but one tiller. The primary roots were greatly reduced from their normal development, and together with the sub-crown internode usually became straw-coloured. While sclerotium-like bodies composed of fungal hyphae were observed on the underground organs and occasionally above the crown, the cause of the disease has not yet been established.

B. (R. E. D.). **Maize stripe disease.**—*Trop. Agriculture*, x, 8, p. 221, 1933.

In March, 1933, sorghum growing in Trinidad developed leaf symptoms resembling those of maize stripe [*R.A.M.*, xii, p. 756] which was experimentally transmitted by the leafhopper *Peregrinus maydis* from maize to sorghum with the production of symptoms resembling those on sorghum in the field. It is concluded that the two diseases are identical.

Barjaktarovič (S. S.) & Bogdanovič (S. B.). **Untersuchungen über die Wirkung des Maisbrandes (Ustilago maidis).** [Investigations on the action of Maize smut (*Ustilago maydis*).]—*Arch. Exper. Path. u. Pharmakol.*, clxxiii, 4–6, pp. 381–387, 1933.

In connexion with a study on the pharmacological uses of maize smut (*Ustilago maydis*) [*U. zeae*] in Bulgaria, the writers conducted inoculation tests [details of which are given] on young rabbits of both sexes with a macerated infusion of spore dust. The fresh preparation was found to induce slight hyperglycaemia, but after keeping for a year this property was lost. Both in the fresh state and after keeping for a year the infusion arrested or reversed adrenalin hyperglycaemia, whether administered before or after the adrenalin, and the continuous administration of the smut preparation reduced or prevented the condition in question. It is concluded, therefore, that *U. zeae* contains a substance which acts similarly to ergotamin on adrenalin hyperglycaemia [*R.A.M.*, xi, p. 38].

Voorhees (R. K.). **Effect of certain environmental factors on the germination of the sporangia of Physoderma zeae-maydis.** —*Journ. Agric. Res.*, xlvii, 8, pp. 609–615, 1933.

In the controlled experiments briefly reported in this paper the sporangia of *Physoderma zeae-maydis* [*R.A.M.*, xii, p. 431] were shown to germinate equally well in tap water, distilled water, and maize leaf extract. Continuous renewal of fresh air in the culture containers did not appear to be an essential factor for germination. Direct sunlight appeared to have a lethal effect on the sporangia, which germinated best in a moist chamber receiving light from a north window; total darkness inhibited the germination. The optimum reaction of distilled water for germination was P_H 7·4, at which 88 per cent. of the sporangia liberated zoospores, while at P_H 2·5 there was no germination. Total absence of oxygen inhibited the germination, but the sporangia germinated as freely in 20 per cent. oxygen as in normal air; this percentage of oxygen

changed the P_H value of the distilled water used from 6·9 to 7·6. In the presence of 10 per cent. carbon dioxide the germination was reduced by only 1 per cent. of that (80 per cent.) in normal air. The sporangia were shown to be tolerant of a very wide range of temperatures, since zoospores were obtained from sporangia exposed for 30 days to temperatures as low as 0° and as high as 70° C., but they were killed after two days' exposure to 80°. When stored in laboratory bottles for one, two, and three years, the germination of the sporangia was 70, 46, and 0 per cent., respectively [cf. ibid., xii, p. 432].

STAKMAN (E. C.), TYLER (L. J.), & HAFSTAD (G. E.). **The constancy of cultural characters and pathogenicity in variant lines of Ustilago zeae.**—*Bull. Torrey Bot. Club*, lx, 8, pp. 565–572, 2 pl., 1933.

From a single monosporidial, unisexual line of maize smut (*Ustilago zeae*), W(est) V(irgini)a A8, 162 distinct lines arose as sectors in colonies of the original line and its variant derivatives [*R.A.M.*, ix, p. 713]. For the past 4½ to 5 years 14 variant lines, each apparently constituting a distinct biotype, have maintained their characteristic features on artificial media. After three years several of the mutants in their turn produced sectors, from which new lines were isolated, supporting the view that sectoring results primarily from mutation rather than from segregation, a relatively infrequent phenomenon which could scarcely have been so long delayed. Further weight is lent to this view by inoculation experiments on Northwestern Dent maize in 1932 with crosses between W.Va. A8 and several of its derivatives on the one hand and Minnesota A and Italy A1 on the other. The same results were obtained as in the 1928 tests with the same material on Golden Bantam, showing that their pathogenic characters had remained remarkably constant. Certain of the variants differed mutually and from the original line in pathogenicity factors, and the constancy of these differences indicated that genotypic changes were involved. Evidently, therefore, the so-called physiologic forms of the smuts may comprise a very large number of biotypes arising from monosporidial lines apparently by mutation.

ALLEN (RUTH F.). **The spermatia of Corn rust, Puccinia sorghi.**—*Phytopath.*, xxiii, 11, pp. 923–925, 1 fig., 1933.

A cytological study of *Puccinia sorghi* [*P. maydis*] from artificially inoculated *Oxalis* plants [*R.A.M.*, xii, p. 388] showed that the entry of the nucleus of the spermatium into the paraphysis is preceded by the secretion of a small mass of dark-staining matter at the point of attachment which serves to fix the spermatium to the hyphal wall. The nucleus passes from the spermatium into the paraphysis through an open channel [cf. ibid., xii, p. 777], the stages in its passage being clearly followed. Some indications were obtained that the spermatia fuse directly with young, vigorous paraphyses, whereas when the latter are old and decadent, the spermatia germinate and their germ-tubes grow down through the ostiole into the spermogonium.

HAYES (H. K.), JOHNSON (I. J.), & STAKMAN (E. C.). **Reaction of Maize seedlings to Gibberella saubinetii.**—*Phytopath.*, xxiii, 11, pp. 905–911, 1933.

Using a pure culture of the strain of *Gibberella saubinetii* from maize previously studied by McIndoe [*R.A.M.*, x, p. 724], the writers determined the reaction of seedlings (chiefly the F_4 and F_5 generations of hybrids developed at the Minnesota Agricultural Experiment Station, with a few selfed lines of Crosby and Golden Bantam) to replicated greenhouse inoculations with the organism at controlled soil temperatures ranging from 2° to 15° C.

It was found that the seedlings from the same ears showed sufficiently uniform results as to indicate that the method would be suitable for the isolation of lines that might be consistently resistant or susceptible. The results when tested over two seasons, however, indicated that inheritance is not the primary cause of the uniformity of reaction in different replicates from the same ear, which is evidently determined to some extent by the conditions under which the ear develops. It would seem, therefore, that a study of seedling blight by this method can scarcely advance the maize-breeding scheme, and other lines of investigation have accordingly been planned. No significant relationship was apparent between reaction to *G. saubinetii* and indices of plant vigour.

MELCHERS (L. E.). **Physiologic specialization of Sphacelotheca cruenta (Kühn) Potter.**—*Journ. Agric. Res.*, xlvii, 5, pp. 339–342, 1933.

The results of three years' pathogenicity tests at the Kansas Agricultural Experiment Station showed the existence of two physiologic strains of *Sphacelotheca cruenta* [*R.A.M.*, xii, p. 432], one of which (form 1) was originally obtained from India on Black Amber sorgo, and the other (form 2) was propagated from a single smutted head of a feterita plant which was found in the United States by Ficke in 1928, in a field containing many varieties of sorghum. Form 1 very readily attacks kafir × feterita and Pierce kaferita, which are not infected to any extent by form 2, while the latter heavily infects the varieties Red Amber × feterita and White Yolo which are immune from form 1. In general, the milos, feteritas, hegari, and Dwarf Shantung kaoliang were found to be extremely resistant to, if not immune from, both forms, but there was evidence that certain varieties of feterita and milo, generally regarded as immune, may be attacked by one or both forms. It is believed that other forms of *S. cruenta* may be found if additional collections of this smut are tested on a more extensive group of sorghums.

MELCHERS (L. E.). **Belated development of kernel smut (Sphacelotheca sorghi) in apparently healthy Sorghum plants.**—*Journ. Agric. Res.*, xlvii, 5, pp. 343–350, 1 fig., 1933.

The investigation reported in this paper was carried out from 1929 to 1932 at the Kansas Agricultural Experiment Station to determine whether the relatively low percentage of apparently infected plants usually obtained in infection experiments with the covered kernel smut of sorghum (*Sphacelotheca sorghi*) [*R.A.M.*, v,

p. 88; xii, p. 432] is due to an escape from infection, as suggested by Martin and Ratliffe [ibid., vi, p. 664] or whether the disease fails to develop despite the presence of the parasite in the host tissues. The results of the experiments on approximately 105 varieties, selections, and hybrids of sorghum, the seed of which was heavily inoculated with smut spores of five physiologic forms of *S. sorghi*, showed that cutting back the plants of susceptible varieties raised from such seed, which did not show the smut in the primary heads, was frequently followed by the development of the smut in the new growth of axillary shoots and in the shoots developed from sucker buds, thus showing that infection had succeeded and viable mycelium was present within the host tissues. Similar treatment of plants belonging to highly resistant or immune varieties, on the other hand, did not result in the production of smutted heads on the secondary growth, presumably because of the absence of viable hyphae in their tissues. A direct relationship was also noted between the degree of susceptibility (as expressed by primary head infection) of a given variety and the increase in covered kernel smut obtained by mutilation of the plants. Physiologic form 2, the milo form, not only attacked a greater number of varieties, including the usually resistant milo, hegari, and White Yolo, but also caused a higher percentage of covered kernel smut within a variety than the other four forms.

While the mechanism of infection and spread in the host tissues of *S. sorghi* has not yet been studied histologically, it is suggested that the infection hyphae of the parasite may invade not the apical cells of the plant but the meristematic regions farther back, where leaf and lateral stem differentiation is taking place, so that the apical portion might outgrow the infection and produce a smut-free inflorescence. This would be especially likely if invasion of the meristematic tissues occurs through division of cells containing mycelial fragments, and not through growth of the fungus from cell to cell.

BATES (G. R.). **Oil glands of Citrus fruits as an avenue of infection.**—*Nature*, cxxxii, 3341, pp. 751–752, 1933.

Freshly picked oranges inoculated by needle pricks with *Penicillium digitatum* between the oil glands showed little or no tendency to decay, whereas 80 to 100 per cent. of the fruits punctured by the needle in the oil glands developed rotting. In order to test the toxicity of the oil alone to the spores of the common orange-rotting fungi, *P. digitatum*, *P. italicum*, *Oospora-citri-aurantii*, and *Colletotrichum gloeosporioides*, a small quantity extracted from Valencia oranges was placed in test-tubes with a heavy spore inoculum and maintained at 39° and 67° F., small loopfuls of the suspension being transferred at intervals to prune agar. The thin-walled spores of *O. citri-aurantii* and *C. gloeosporioides* were killed immediately by the oil at both temperatures, whereas those of *P. digitatum* required eight hours' immersion in the oil at 67° to kill them and were still germinating slowly after 50 hours at 39°. The spores of *P. italicum* reacted to the oil in approximately the same way as those of *P. digitatum*. The fact (apparently not hitherto observed) that the oil glands serve as

channels of infection by *Penicillium* spp. further emphasizes the necessity for extreme care in the handling of the fruit.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1932–1933.**—*Mysore Coffee Exper. Stat. Bull.* 10, 16 pp., 1933.

During the period under review homogeneous cultures representative of the two strains of *Hemileia vastatrix* recently discovered [*R.A.M.*, xi, p. 636] were established on living coffee leaves at the Mysore Coffee Experiment Station. Cultures thus isolated and tested were utilized in estimating the resistance to leaf disease of coffee seedlings produced at the Station, the first results obtained indicating that resistance is dominant to susceptibility. It is considered to be very probable that the mode of inheritance follows comparatively simple Mendelian lines. Evidence was obtained that in resistant leaves entrance of the germ-tube takes place normally, and that the entering tube may proceed to the formation of haustoria. Preliminary experiments showed that shade reduced the vigour of spore production.

Pure cultures of *Fomes lamaoensis* [*F. noxius*: ibid., xi, p. 367; xii, p. 55] on wood blocks were buried in contact with the tap-root or lateral roots of four coffee plants in tubs, and about fourteen months later two of the inoculated plants showed typical symptoms of brown root disease; the wood blocks had been placed in direct contact with the tap-root of the plants which subsequently became infected, whereas in the two which remained healthy they had been placed near a lateral root.

Notes are given on further studies of the effect of spraying coffee at different times with mixtures of various strengths [chiefly against *H. vastatrix*, *Corticium koleroga*, and die-back: see next abstract].

The evidence obtained in 1932–3 strongly supported the view previously expressed that black bean disease of coffee [ibid., xii, p. 22] is associated with unfavourable climatic and nutritional conditions.

MAYNE (W. W.), NARASIMHAN (M. J.), & SREENIVASAN (K. H.). **Spraying of Coffee in South India.**—*Mysore Coffee Exper. Stat. Bull.* 9, 69 pp., 8 pl., 1933.

After pointing out the importance of spraying in the control of coffee diseases such as black rot (*Corticium koleroga*) [see next abstract], leaf disease (*Hemileia vastatrix*), and die-back, as well as insect infestation, the author describes a comprehensive series of experiments conducted in Mysore with various spray mixtures against *H. vastatrix* [*R.A.M.*, xii, pp. 435, 436]. From the results obtained it is concluded that the most suitable spray to use at present, when cost, safety in application, and efficiency are all considered, is Bordeaux mixture with lime-caseinate, which from the point of view of efficacy against *H. vastatrix* and crop yield gave better results than Burgundy mixture. Figures furnished by planters showed that the increase in crop yield that resulted from spraying in many instances ranged from 40 to 120 per cent., though the evidence indicated that where the average yields of unsprayed coffee are already as high as 5 cwt. per acre, the increase

of crop due to spraying will be less striking. During 1932 from 18,000 to 20,000 acres of coffee in Mysore State were sprayed, and the experience gained from the authors' own work is supplemented by much practical information from that of the planters.

Attention is drawn to the fact that by means of a simple appliance devised by the junior author the D.S.P. sprayer [loc. cit.] can be fitted with four lines of hose instead of two.

NARASIMHAN (M. J.). **Black rot of Coffee in Mysore.**—*Phytopath.*, xxiii, 11, pp. 875–886, 5 figs., 1933.

The examination of coffee leaves affected by black rot (*Corticium koleroga*) in Mysore, India [*R.A.M.*, x, p. 239], showed that the course of the disease can be divided into two distinct phases, namely, the early pellicle and late sclerotial, in the first of which a uniform white film covers the dorsal surface while the second is characterized by hyphal clumps scattered over the infected area, united by a slender mycelium.

The pellicle marking the incipient phase of black rot up to and including the sporing stage of the fungus is composed of a mass of interwoven hyaline threads with isolated primary strands consisting of a number of parallel hyphae [ibid., iii, p. 397]. 'Bridging hyphae' [ibid., xii, p. 777] form lateral unions between two main hyphae, but neither clamp-connexions nor anchor cells [ibid., iv, p. 67] were observed. The basidia appear at the ends of lateral branches and are not markedly clustered. Fully developed basidiospores from fresh material measured 9·1 by 3·4 μ, while the length of the sterigmata ranged from 5 to 11·5 μ. Both the spores and the hyphae resulting from germination are uninucleate, whereas after lateral fusions have occurred the newly formed hyphae are always binucleate. The sclerotial stage of black rot follows the sporing period and is characterized by a gradual change in the colour of the mycelium from white to fuscous, while the affected leaf turns rusty-brown. The sclerotia are formed by repeated branching of short, binucleate cells and eventually assume a pseudo-parenchymatous consistency; they serve to tide the fungus over the dry season. Only during the later, sclerotial stage of black rot has any evidence of leaf penetration by *C. koleroga* been observed. The hyphae emerging from the compact masses of pseudo-parenchymatous cells enter the leaf tissue through the stomata and penetrate the spongy parenchyma, often reaching the palisade cells.

The writer's investigations are stated to afford no evidence that the similar types of black rot affecting coffee in South America (such as the 'zilverdraadziekte' of Surinam and the 'candelillo' of Venezuela) [cf. also ibid., xi, p. 431] and other tropical countries are of different origin from the Mysore disease, though an exception may be made in the case of the Java cobweb thread blight with anchor cells [ibid., viii, p. 777].

PICADO (C.). **Colletotrichum des Caféiers et lésions radiculaires.** [The Coffee *Colletotrichum* and root lesions.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 8, pp. 268–270, 1933.

The author states that the two fungi associated with the disease

of the coffee bush recently described from Costa Rica [*R.A.M.*, xi, p. 369] have been identified by Wollenweber as a species of *Colletotrichum* forming perithecia of the *Glomerella cingulata* type, and *Fusarium lateritium* var. *majus*, respectively. He also gives a very brief outline of experiments which indicated that the primary cause of the disease is the species of *Fusarium* on the roots of the coffee bush, while the *Colletotrichum* sp. on the leaves is but a debility parasite.

BARDUCCI (T. B.). **Un nuevo método para la determinación de 'la marchitez' o 'Cotton wilt' del Algodonero, el método de la hoja o 'Cotton wilt' leaf index.** [A new method for the diagnosis of Cotton wilt, the leaf method or 'Cotton wilt' leaf index.]—*Min. de Fomento, Direcc. de Agric. y Gan., Estac. Exper. Agric. de la Molina Circ.* 21, 15 pp., 1 col. pl., 4 figs., 1933.

A new method has been devised for distinguishing healthy cotton plants from those affected by wilt (*Fusarium vasinfectum*) in Peru [*R.A.M.*, xi, p. 225], where selection for resistance to this destructive disease has already resulted in the development of the Tangüis variety. If a large leaf, situated half-way up the stem of a normal plant, be detached, the almost triangular scar at the base of the petiole will appear transparent and entirely green, whereas in the case of wilt infection one or more brown spots will be observed, formed by infected vessels close to the central cylinder. This method has numerous advantages, being extremely accurate (in 96·21 per cent. of the 2,000 leaves examined), simple, convenient, and rapid in practice. It is advisable to test three leaves from each plant (from the upper, middle, and lower parts of the stem) in order to obtain absolute exactitude.

REA (H. E.). **The effect of tillage on eradication of Cotton root rot.**—*Journ. Amer. Soc. Agron.*, xxv, 11, pp. 764–771, 1933.

Several tillage systems were compared for their relative efficacy in the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 628] in widely separated sections of the Blackland Prairie region of Texas.

Although the stand of host plants of the fungus, e.g. *Physalis mollis* and *Ipomoea trifida*, was reduced in proportion to the intensity and duration of the tillage treatments, the reductions in the incidence of root rot during the course of the experiments were not consistently parallel with the decline in the numbers of perennial weed hosts. It was evident that only a small percentage of the infection surviving the more drastic tillage operations was carried over on the live roots of such plants. Sclerotia maturing before the effects of the treatments could operate are thought to have been largely responsible for the perpetuation of the disease on the trial plots.

STEYAERT (R. L.) & VRYDAGH (J.). **Étude sur une maladie grave du Cotonnier provoquée par les piqûres d'Helopeltis.** [A study on a serious disease of Cotton caused by the bites of

Helopeltis.]—Reprinted from *Mem. Inst. Roy. Col. Belge (Section Sci. Nat. et Med.)*, i, 7, 53 pp., 7 pl., 8 figs., 2 graphs, 1 map, 1933.

A detailed account is given of the authors' extensive investigation of a disease of cotton marked by the formation of numerous depressed black stem cankers which broke out with considerable severity at Kulu, Belgian Congo, in 1930, and reappeared a year later at Bomokandi and Bambesa. Experiments demonstrated that the disease, which was at first considered to be due to *Bacterium malvacearum*, had in fact resulted from injury by the mosquito bugs *Helopeltis bergrothi* and *H. sanguineus*, and the description of the effects produced by the insects on the stems indicates that there is a close similarity between these lesions and the cankers described by Smee and Leach on tea in Nyasaland as due to *H. bergrothi* [*R.A.M.*, xii, p. 332]. A few of the insects were observed in the course of these investigations to be parasitized by a species of *Sclerotium*, characterized by the formation of light to dark brown sclerotia, 48 to 100 μ in diameter, with a cortex of brown cells surrounding an inner hyaline, thick-walled pseudoparenchyma. In culture the sclerotia were up to 140 μ in maximum diameter.

SAWYER (W. H.). **The development of Entomophthora sphaerosperma upon Rhopobota vacciniana.**—*Ann. of Botany*, xlvii, 188, pp. 799–809, 2 pl., 1 fig., 1933.

This is a detailed account of the author's studies of the development of *Entomophthora sphaerosperma* [*R.A.M.*, xi, p. 371] in the tissues of *Rhopobota vacciniana* larvae infected with pure cultures of the fungus under controlled conditions at Harvard University. Conidia adhering to the surface of the insect were shown under favourable conditions to germinate in 90 minutes by the production of a germ-tube which penetrated the body wall by enzymic digestion in from 2 to 12 hours after germination; infection through the digestive tract was never observed. After penetration, the fungus grows rapidly in the blood, the circulation of which serves to distribute it throughout all the organs of the host, among which the fat-body and the oenocytes are disintegrated the most rapidly. Eventually all the internal organs are completely destroyed, until nothing remains of the original larva except the chitinous structures and the remnants of the food material ingested by the insect. As the available amount of nutrient substance diminishes in the last stages of host destruction, the fungus is stimulated to the production of hyphal bodies [ibid., viii, p. 719] by segmentation of its hyphae, this phase marking the end of its vegetative growth. The hyphal bodies either develop into a mass of internal resting spores, or give rise to conidiophores which burst through the cuticle, the life-cycle from inoculation to the production of conidia lasting on the average about 72 hours in small larvae.

The first signs of infection appear in the larva only after the disease is well established throughout its body, and are a change from a green to a yellowish colour, and restless movements, followed by sluggishness and increased turgor. The insect dies towards the end of the vegetative development of the fungus.

MORQUER (R.) & DE BOISSEZON (P.). **Étude biologique d'une association fongo-bactérienne chez la larve de Theobaldia annulata Sch. (Culicide).** [A biological study of a fungo-bacterial association in the larva of *Theobaldia annulata* Sch. (Culicidae).]—*Rev. Gén. de Botanique*, xlv, 539, pp. 537–574, 9 figs., 1933.

Larvae of the mosquito *Theobaldia annulata* reared in the laboratory showed a considerable mortality associated with a whitish fungal growth (in which bacteria also occurred) arising from the anal region. Two fungi were isolated from the mass and determined as *Penicillium palitans* (recorded for the first time in France) and *Botrytis cinerea* forma *theobaldiae* n.f. The parasitism of the latter was definitely established by inoculations of *Culex pipiens*, infection occurring only during the two initial larval stages, especially the first. *P. palitans* failed to infect *C. pipiens* and is considered to be a saprophyte, like the bacteria found associated with the fungi.

BENEDEK (T.) & SPECHT (G.). **Mykologisch-bakteriologische Untersuchungen über Pilze und Bakterien als Symbionten in Kerbtieren.** [Mycological-bacteriological investigations on fungi and bacteria as symbionts in Lecaniidae.]—*Zentralbl. für Bakt.*, Ab. 1 (*Orig.*), cxxx, 1–2, pp. 74–90, 7 figs., 1933.

Previous attempts at the cultivation of the symbionts of the Lecaniidae are stated to have given negative or inconclusive results, but the writers succeeded in culturing two organisms associated with *Lecanium corni* from *Spiraea opulifolia*, red currant, gooseberry, *Corylus avellana*, and vine. The so-called 'primary symbiont', occurring in every one of the 2,000 insects examined, is named *Torula lecanii corni* n. sp. [with a Latin diagnosis], and is characterized by hyaline, septate hyphae, 3·3 to 6·6 μ in diameter, and pale to olive-brown, mostly biscuit-shaped, unicellular, smooth conidia, 6·6 to 16·5 by 6·6 to 9·9 μ, the mycelial phase developing exclusively after the death of the host. The fungus grew well on Sabouraud's and Benedek's glucose agar and other nutrient media, its optimum temperature being from 15° to 27° C. The 'secondary symbiont', a sporogenous bacillus allied to *Bacillus megatherium*, was more sparsely represented.

TALICE (R. V.) & IRULEGUY (J. B.). **Parasitierende Pilze und Mykosen beim Menschen in Uruguay.** [Parasitic fungi and mycoses of man in Uruguay.]—*Arch. Urug. Med. Cir. y Esp.*, xi, 4, pp. 537–574, 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cxii, 17–18, pp. 425–426, 1933.]

Human mycoses in Uruguay are divided on a clinico-etiological basis into five groups, viz., (I) dermatomycoses primarily affecting the epidermis, (II) blastomycoses, (III) sporotrichoses, (IV) aspergilloses and related skin diseases, and (V) actinomycoses and allied disorders. Annotated lists are given of the fungi responsible for Uruguayan mycoses under each of these groups.

PORTUGAL (H.). **Einteilung der Hautmykosen.** [Distribution of the dermatomycoses.]—*Rev. Med.-Chir. Brasil*, xlii, 2, pp. 45–54, 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cxii, 17–18, pp. 424–425, 1934.]

The dermatomycoses are divided into two main groups according to the site of infection, viz., true mycoses in which the fungus is to be found in the diseased area itself, and mycids [*R.A.M.*, xiii, p. 164] where the causal organism is situated in a part remote from that showing the symptoms. The mycoses are subdivided according to the epidermal, dermal, and deeper sites of infection.

DE ALMEIDA (F.). **As blastomycoses no Brasil.** [The blastomycoses in Brazil.]—*Ann. Fac. Med. São Paulo*, ix, pp. 69–163, 64 figs., 3 maps, 1933. [English summary.]

Chapter I of this comprehensive study of the Brazilian blastomycoses deals with the definition and classification of the blastomycoses, while each of the ten following chapters is devoted to one of the causal organisms, viz., *Candida albicans*; *C. butantanensis*, isolated by J. M. Gomes in 1924 (under the name of *Monilia butantanensis* n. sp.) from a pulmonary lesion simulating tuberculosis; *Neogeotrichum pulmoneum*, originally detected in 1912 by O. Magalhães as an agent of pulmonary mycosis; *Torulopsis* or *Mycoderma* [*Endomyces*] *dermatitidis* (syns. *Blastomyces dermatitidis* Gilchr. & Stokes, *Cryptococcus dermatitidis* Cast., &c.) [see next abstract]; *Proteomyces infestans*, isolated and described by Moses and Vianna in 1913 from a single case of human mycosis; *Coccidioides immitis*, which is studied in detail from the morphological, physiological, and clinical standpoints; *Pseudococcidioides mazzai*, believed by F. P. Almeida to be identical with the foregoing [ibid., xi, p. 782]; *Paracoccidioides brasiliensis* [ibid., x, p. 310], the differences between which and *C. immitis* are indicated on the basis of comprehensive studies; *Rhinosporidium seeberi* [ibid., xii, p. 568], of which only one case appears to have been reported from Brazil; and *Trichosporium* or *Acrotheca pedrosoi*, responsible for chromoblastomycosis [ibid., xi, p. 645 and next abstract].

OTA (M.) & KAWATSURE (S.). **Zur Ätiologie der echten und falschen Blastomykosen, besonders der Gilchristschen Krankheit.** [On the etiology of the true and spurious blastomycoses, especially of Gilchrist's disease.]—*Arch. für Dermatol.*, clxix, 2, pp. 149–172, 11 figs., 1933.

An attempt is made to define the obscure position occupied in the dermatomycotic branch of medicine by the true and spurious blastomycoses. True blastomycoses are those evoked by ascogenous or anascogenous yeasts, the former represented by *Saccharomyces*, *Debaryomyces*, and *Willia* spp., as human pathogens, while opinions are divided on the classification of the latter. The writers consider that those species forming no mycelium should be referred to the genus *Torulopsis* Berlese [*R.A.M.*, xi, p. 642].

The so-called oidiomycoses, often known as blastomycoses, are etiologically divergent conditions. 'Gilchrist's disease' or American blastomycosis, commonly placed in this group, is caused by two

fungi, namely *Aleurisma tulanense* Castellani, 1926 (syns. *Rhinotrichum* sp. Ota, 1925, *Blastomycoides tulanensis* Cast., 1926 [ibid., xii, p. 171], *Glenospora gammeli* Pollacci et Nannizzi, 1927, *Acladium gammeli* Ota, 1928, and probably *Blastomyces* [*Endomyces*] *dermatitidis* Gilchr. and Stokes [ibid., xiii, p. 95 and preceding abstract] and a number of others), and *Scopulariopsis americana* Ota, 1926 [see next abstract]. Agostini's determinations of *Geotrichum immite* (*Blastomycoides immitis*) and *Monosporium tulanense* (*B. tulanensis*) [ibid., xii, p. 171; xiii, p. 162] are not accepted by the writers. The pathological conditions simulating blastomycosis caused by species of *Geotrichum* (*Oidium* or *Mycoderma*) and *Trichosporon* (*Geotrichoides*) must not be confused with true blastomycosis or with Gilchrist's disease.

The taxonomic position of *Coccidioides immitis* [ibid., xiii, p. 30] is hard to define, but it would seem, from the writers' and da Fonseca's and Leão's studies to approximate closely to *Protomyces*. The unsuitably named 'chromoblastomycosis' may be due either to *Phialophora verrucosa* or *Trichosporium pedrosoi* [ibid., xi, p. 645; xii, p. 370, and preceding abstract].

KAWATSURE (S.). **Tierexperimentelle Untersuchungen über die Erreger von sogenannten amerikanischen Blastomykosen: Scopulariopsis americana, Aleurisma tulanense und Coccidioides immitis.** [Experimental studies on animals with the agents of so-called American blastomycoses: *Scopulariopsis americana*, *Aleurisma tulanense*, and *Coccidioides immitis*.] —*Arch. für Dermatol.*, clxix, 2, pp. 173–199, 11 figs., 1933.

Full clinical details are given of the pathological changes induced in laboratory animals by inoculation with *Scopulariopsis americana*, *Aleurisma tulanense* [? *Endomyces dermatitidis*], and *Coccidioides immitis* [see preceding abstract]. All the organisms produce in the lungs, spleen, and other internal organs tuberculoid nodules with a caseous central abscess surrounded by granular tissue and numerous epithelioid cells, frequently also by giant cells (less conspicuous in the lesions caused by *A. tulanense*), which in turn are encircled by connective tissue of varying thickness. *S. americana* and *A. tulanense* develop in the granulomata as spherical yeast forms, 10 to 16 μ in diameter, generally composed of three layers, the outermost a well-defined membrane, the intermediate a poorly staining circular zone, and in the centre a roundish mass of protoplasm. At this stage the differentiation of the two species is difficult. Both are involved in the causation of 'Gilchrist's disease', the classical descriptions of which, however, have most likely been based on *S. americana*, the more virulent of the two parasites. The lesions produced by *C. immitis* may usually be recognized by the occurrence of the fungus in the shape of spore cysts, 20 to 40 μ or more in diameter, but occasionally this species is also represented by smaller yeast-like forms, about 10 μ in diameter, which complicate identification. Still smaller forms (5 μ in diameter) may be detected in the lung nodules, probably endospores liberated from the cyst membrane. The prognosis of *C. immitis* is much graver than that of the other two fungi under discussion.

CIARROCCHI (L.). **Onicomicosi da Mycotorula.** [Onychomycosis due to *Mycotorula.*]—*Giorn. Ital. di Dermatol.*, lxxiv, 2, pp. 415–429, 3 pl., 1933.

Full clinical details are given of a case of paronychia and onychia of both hands in a 22-year-old female domestic servant in Rome. The fungus isolated from the diseased scales on Sabouraud's agar at 16° to 20° C. formed creamy, thick, smooth, whitish to yellow, radiating colonies, and was characterized by a hyaline pseudomycelium composed of segments measuring 30 to 60 by 3·5 μ, from the upper ends of which were budded off hyaline blastospores, which were either globular (4 μ in diameter) or elliptical (4·5 by 3 μ) and were sometimes guttulate. Globose, hyaline chlamydospores (6 to 7·5 μ in diameter) were also formed. The organism, which was pathogenic to laboratory animals, is classified [with a Latin diagnosis] as *Mycotorula onychophila* n. sp., and in this connexion a brief review is given of the systematic position of the yeast-like fungi [cf. *R.A.M.*, xiii, p. 186].

WEIDMAN (F. D.). **Cutaneous torulosis: the identification of yeast cells in general in histologic sections.**—*Southern Med. Journ.*, xxvi, 10, pp. 851–863, 14 figs., 1933.

In this paper the writer enumerates and analyses the meagre clinical data on cutaneous torulosis of man and the monkey *Macacus rhesus*, and describes at some length his observations on (1) its pathological histology; (2) experimental reproduction in animals; (3) the morphology of the organism, which was identified as *Torula histolytica*, in pus; and (4) the cultural characters of the fungus.

Extremely minute yeast cells preponderated in the lesions, but a number of giant forms 10 to 15 times the diameter of the foregoing and producing linear and lateral chains of buds, were also observed. Mycelial formation was not detected. The organism grew well on Sabouraud's and other standard media between P_H 5·8 and 8·6, forming heaped, glistening white or creamy, later brown, watery colonies. The capacity of *T. histolytica* for fermenting carbohydrates is practically nil; acid was produced in glucose and levulose by all the 19 strains from cerebrospinal cases used in the tests, but as great irregularity in respect of other sugars was shown by the various strains, it is thought that differences in acid production are not sufficiently reliable for specific differentiation. The organism proved resistant to gentian violet at a concentration of 1 in 1,000. Mice and rats were more susceptible to artificial infection than guinea-pigs and dogs.

CREMER (G.). **Untersuchungen über die Epidermophytie der Füsse und Hände in Amsterdam.** [Investigations on epidermophytosis of the feet and hands in Amsterdam.]—*Arch. für Dermatol.*, clxix, 2, pp. 244–258, 6 figs., 1933.

The results of an examination of 75 patients suffering from epidermophytosis of the feet and hands at the Amsterdam University Skin Clinic confirmed the views of Jadassohn and Peck with regard to the spread of infection to the hands in the form of dysidrotic eruptions (epidermophytids) [*R.A.M.*, ix, p. 383; xiii, p. 164].

The organism responsible for the condition in the feet was usually a yellowish-white *Epidermophyton* differing from the common variants of Kaufmann-Wolf's fungus, possibly through pleomorphic degeneration; *E. inguinale* [*E. floccosum*: ibid., xii, p. 630] was only isolated once.

SCHMIDT (P. W.). **Zur Pathogenese der Epidermophytien und Trichophytien der Hände und Füsse unter besonderer Berücksichtigung der ekzematoiden Hautveränderungen mit Kulturergebnissen in 732 Fällen.** [On the pathogenesis of the epidermophytoses and trichophytoses of the hands and feet with special consideration of the eczematoid skin changes, with cultural results in 732 cases.]—*Arch. für Dermatol.*, clxix, 2, pp. 259–294, 9 figs., 1933.

At the Münster (Westphalia) University Skin Clinic fungous diseases constitute 10 per cent. of the total cases examined [*R.A.M.*, xii, p. 444], in half of which the hands and feet are involved. The last few years have been marked by a gradual increase of these diseases. Fungi were isolated from 73 per cent. of the 243 cases of dysidrotic and squamous conditions of the feet. The designation 'dysidrotic' should be replaced, in the writer's opinion, by the term 'pseudo-dysidrotic'. The Kaufmann-Wolf *Epidermophyton* [see preceding abstract] developed in over 77 per cent. of the cultures, *E. inguinale* [*E. floccosum*] in 19 per cent., and *Trichophyton cerebriforme* and *Achorion quinckeanum* [see next abstract] in 2·4 per cent. In two cases of generalized epidermophytosis, starting from the feet, Kaufmann-Wolf's fungus and *E. floccosum*, respectively, were isolated from the pityriasis-like areas on the body and upper arm, to which the organisms were probably conveyed by the blood stream. Fungi were isolated from 23·4 per cent. of the 469 cases of epidermophytosis of the hands, Kaufmann-Wolf's fungus being obtained in 60 per cent., and *E. floccosum* in 11 per cent., while 28 per cent. yielded *T. rosaceum*, *T. gypseum asteroides* [*T. mentagrophytes*], *T. cerebriforme*, *T. acuminatum*, *A. quinckeanum*, or *A. schoenleini*.

The clinical and etiological aspects of these conditions are very fully discussed.

BEINTEMA (K.). **Klinische und kulturelle Beobachtungen bei Achorion quinckeanum.** [Clinical and cultural observations on *Achorion quinckeanum*.]—*Dermatol. Zeitschr.*, lxviii, 1–2, pp. 21–27, 3 figs., 1933.

Favus caused by *Achorion schoenleini* is stated to be very prevalent in Holland, whereas, during the last six years, *A. gypseum* [*R.A.M.*, xi, pp. 575, 645] was only once isolated and *A. quinckeanum* [ibid., xii, p. 444 and preceding abstract] seven times. The last-named was twice isolated from scalp hair (stated to be a very rare site) which showed the clinical picture of a kerion celsi, with incipient hyphal and spore formation on the exterior of the hairs.

Attention is drawn to the disappearance of the spindles from cultures of *A. quinckeanum* and their replacement by rows of chlamydospores, as well as to the occurrence of pleomorphism on thin or desiccated media.

DESSY (G.). **La chimiothérapie des mycoses. IIIème Partie: Mučoromycose. IIème Communication: expériences 'in vivo'.** [The chemicotheraphy of mycoses. Third Part. Mucormycosis. Second communication: experiments '*in vivo*'.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, v, 9, pp. 201–206, 1933.

Continuing his investigations [*R.A.M.*, xii, p. 693] the author conducted experiments *in vivo* to ascertain the therapeutic power of brilliant green, methyl violet, malachite green, copper sulphate, nickel chloride, and cobalt chloride in an experimental infection of rabbits with *Mucor pusillus*, a fungus known to be constantly a strong rabbit pathogen. The results obtained showed that these substances when introduced into the veins exercised no chemicotherapeutic action against this fungus.

TSCHERNJAK (W. S.). **Die Schimmelpilzmykose des Magens bei Schweinen.** [Gasteromycosis in pigs.]—*Zeitschr. für Infektionskrankh. &c. der Haustiere*, xlv, 1, pp. 72–73, 6 figs., 1933.

Full particulars are given of two cases of gasteromycosis (stated to be a very rare condition) in young pigs at Woronesh, U.S.S.R., the fungus isolated from both animals being characterized by a densely woven mycelium consisting of branched hyphae, 5 to 8 μ in thickness, with clavate swellings at the tips, staining only with haematoxylin-eosin. No spores were observed and cultures could not be obtained, but the organism is tentatively identified as a *Mucor*. Peculiarities of the first case under observation were the mass of giant cells (up to 300 μ in diameter) by which the fungus was ingested (phagocytosis), the penetration of the organism into the vessels, and gas formation. The gastric lining of both animals was completely necrosed.

VAN BEYMA THOE KINGMA (F. H.). **Ein unbekanntes pathogenes Cephalosporium, Cephalosporium stühmeri Schmidt et van Beyma.** [An unknown pathogenic *Cephalosporium, Cephalosporium stühmeri* Schmidt et van Beyma.]—*Zentralbl. für Bakt.*, Ab. 1, cxxx, 1–2, pp. 102–105, 3 figs., 1933.

A species of *Cephalosporium* differing considerably from the only other representative of the genus recorded as a human pathogen, namely, *C. acremonium* [*R.A.M.*, xii, p. 290; see also xii, p. 511], was isolated from two cases of dermatomycosis, one involving the scalp and the other the hand. A fair degree of similarity with the entomogenous fungus, *C.* (*Acrostalagmus*) *coccidicolum* [ibid., v, p. 97], was shown, but the colony types of the two organisms on Raulin's and beerwort agar are sufficiently distinct to justify their separation. The fungus was described by P. W. Schmidt, of the Skin Clinic of Münster University, Westphalia (where the cases were treated by Prof. Stühmer) and stated by him to agree with one independently recognized as a new species of T. Benedek [ibid., xii, p. 444]; it is accordingly named *C. stuehmeri* Schmidt & van Beyma, a diagnosis in German being supplied.

The greyish-white to light brown, densely matted, radially furcate mycelium, of a somewhat floury consistency, is composed of

sparsely septate hyphae, 2 to 3·3 μ in diameter (up to 6 μ in old cultures); the straight, non-septate, unbranched conidiophores are 30 to 40 μ long, 2 μ wide at the base, tapering towards the apex, where the hyaline, oval to ellipsoid conidia, 3 to 6 by 1·7 to 2·3 μ (average 3·3 by 2 μ) are abstricted in masses to form a 'head' 10 to 15 μ in diameter.

DEY (P. K.). **An Alternaria blight of the Linseed plant.**—*Indian Journ. Agric. Sci.*, iii, 5, pp. 881–896, 2 pl., 1 fig., 1933.

Linseed (*Linum usitatissimum*) in waterlogged fields in the United Provinces, India, has been observed to suffer heavy damage from an apparently new species of *Alternaria* for which the name *A. lini* is proposed [with an English diagnosis]. Losses ranging from 27·9 to 59·6 per cent. of the crops were calculated at the Cawnpore and Gorakhpur Experimental Farms in 1933. The fungus attacks all the aerial organs of the plants, especially the buds, flowers, and upper leaves, the first symptom being the failure of the flowers to open during the day. Minute, dark brown spots appear near the base of the calyx, over which they gradually extend, passing into the pedicel and causing the decay of the inflorescences. The young leaves were invaded from the base, whence the organism also passed into the stem, producing wilting and distortion. Older leaves were usually infected at the tips. In severe cases, associated with very humid conditions, the whole plant shrivelled. The pods, if formed at the time of infection, were invaded similarly to the flowers.

A. lini was readily obtained in pure culture. The hyaline, sparsely septate hyphae measured 2 to 7·5 μ (average 4 μ) in breadth, the conidiophores 2·5 to 4·5 μ (3·5 μ), and the concatenate, dark olive (sooty-black in the mass), flask-shaped, echinulate (except the beak cell), mostly triseptate conidia 24 by 7 μ including the beak cell, the average length of which was 4·9 μ. The conidia are produced by acropetal fragmentation of the conidiophores. In infection the conidia attach themselves to the host surface by means of mucilage developing on their exterior on wetting, assisted by the spines. The apical growth of the germ-tubes, also adhering by their mucilaginous sheath, causes the rupture of the cuticle by mechanical pressure [*R.A.M.*, xii, p. 566].

Inoculations on healthy cut branches of linseed at 74° to 85° F. resulted in a destructive rotting, the symptoms of which agreed with those observed in nature. The only control measures likely to be practicable are the choice of high, well-drained sites and the cultivation of late linseed varieties.

RAMOS (M. M.). **Mechanical injuries to roots and corms of Abacá in relation to heart-rot disease.**—*Philipp. Agric.*, xxii, 5, pp. 322–337, 1933.

Heart rot of abacá (*Musa textilis*), identified by the browning of the youngest furled leaf and blackening of the centre of the pseudostem, has been found by the writer in the Philippines to occur primarily as a sequel to the combined effects of infestation by the weevil *Cosmopolites sordidus* and the virus disease bunchy top [*R.A.M.*, xi, p. 300]. From 10·49 to 22·1 per cent. of the

plants affected by the latter condition died of heart rot in the course of the present investigations on 1,000 plants, while the incidence of the disease following weevil injuries ranged from 53·3 to 90 per cent., the corresponding figures for nematodes (*Heterodera radicicola*) being 9·5 to 20·5 per cent. Root injury was found sometimes to result in the development of the disease. The fungus isolated from heart-rot material caused heart rot in potted abacá seedlings only under damp-chamber conditions and the plants recovered when placed out of doors; it was identified as *Fusarium moniliforme* var. *subglutinans* [ibid., iv, p. 569], full morphological and cultural details being given. It is concluded that heart rot may be regarded as a secondary trouble, developing only on plants weakened from some other cause.

PALM (B. T.). **The gametophytes in a composite affected with 'Aster-yellows'.**—*Svensk Bot. Tidskr.*, xxvii, 4, pp. 420–437, 6 figs., 1933.

No abnormalities were observed in the development of the anthers, tapetal and sporogenous tissues, and male gametophytes of *Troximon glaucum* plants spontaneously affected by aster yellows [*R.A.M.*, xii, p. 446] in Colorado and showing symptoms of stunting, bronzing of the leaves, and proliferation of the floral organs similar to those known in *Aster sinensis* [*Callistephus chinensis*]. In the ovules of these plants, however, the development of the sporogenous cells is delayed or inhibited, while other abnormal features include elongation and flattening of the funiculus and imperfect growth of the integument. The female gametophyte appears to undergo final degeneration at the binuclear stage of the embryo sac, which is formed from a chalazal megaspore. Complete and persistent sterility of the ovule (precluding seed transmission of the disease) is thus effected. Numerous hairs are present in the ovular cavity arising from the epidermis of the placenta, whereas in normal plants no hairs develop near the ovule. The theoretical possibility is suggested that the pollen from an infected plant may convey the virus to the embryo sac of a healthy one in the process of fertilization.

VALLEAU (W. D.), FERGUS (E. N.), & HENSON (L.). **Resistance of Red Clovers to Sclerotinia trifoliorum Erik., and infection studies.**—*Kentucky Agric. Exper. Stat. Bull.* 341, pp. 115–131, 1 fig., 1933.

After an exceptionally mild winter in central Kentucky crown rot (*Sclerotinia trifoliorum*) infection was prevalent in the spring of 1932 throughout 78 plots of one-year-old red clover (*Trifolium pratense*) from various localities at Lexington. Counts of apothecia on the infected area averaged 26·4 per sq. ft. or 1,149,984 per acre. The local Kentucky clover averaged 71 per cent. plants unaffected, as compared with only 26·6 per cent. unaffected plants among the foreign clovers; an English strain had only 13 per cent. unaffected plants, while Tennessee clover was rather less resistant than that from Kentucky. Apparently, a relatively high resistance results from continuous selection made locally over a period of years. By the spring of 1933 only the Kentucky plants were still alive.

When autumn-sown, however, clover adapted to the local conditions appeared to be no more resistant than the unadapted clovers. When dependent upon dead plant material for subsistence the fungus rapidly declined in activity, and it is considered that a saprophytic stage, if it exists, must be subsidiary to the parasitic stage and has little practical significance as a source of infection [cf. *R.A.M.*, viii, p. 793].

In new plantings wind-blown ascospores probably constitute the usual form of infection. Isolations from spots found in autumn on leaves and petioles yielded pure cultures of *S. trifoliorum*, and when apothecia were placed under bell-jars with greenhouse-grown red clover similar spots developed from which the organism was again isolated. *S. trifoliorum* may remain alive in leaf spots as long as the leaves live, and when they die the fungus spreads into the petioles and thence to the crowns. Infection of green leaves is the principal means by which the organism is carried over from the time of spore discharge until weather conditions and host susceptibility enable crown rot to develop.

In point of inherent resistance adapted clovers do not differ from unadapted, but they are hardier and develop more normally so that they possess a fluctuating physiological resistance as distinct from one depending on permanent genetic factors. The evidence obtained indicated that clover tissues produced during warm periods are highly resistant to *S. trifoliorum*, while those produced in cold weather are more susceptible, especially if the variety is unadapted to local conditions. There was no indication of the occurrence of physiologic forms of the fungus.

For the most part, winter and spring attacks of *S. trifoliorum* can be correlated with the production in autumn of most of the apothecia. Apothecia found occasionally in the field in spring, however, are believed to have originated from sclerotia of the second preceding season. Experiments indicated that part of the spring infection in Kentucky results from these spring apothecia.

S. trifoliorum was also found on *Plantago lanceolata* and *Chrysanthemum cinerariaefolium*.

From a detailed study of the literature the suggestion is made that *S. minor* Jagger [ibid., viii, p. 607] and *S. trifoliorum* are identical, the former occurring on a host (usually lettuce), not commonly recognized as a host of the latter.

A bibliography of 15 titles is appended.

WEIMER (J. L.). **Effect of environmental and cultural factors on the dwarf disease of Alfalfa.**—*Journ. Agric. Res.*, xlvii, 6, pp. 351–368, 3 figs., 1 diag., 1933.

The results of experiments started in 1929 at the Riverside, California, experimental farm showed that the development of the dwarf disease of lucerne recently described from that State [*R.A.M.*, x, p. 388] is markedly promoted by high soil moisture, plots which were irrigated twice monthly during the growing season and cut regularly for hay, becoming practically worthless by the middle of the fourth year of cultivation, while similar plots left without irrigation during the seed-growing period retained

a fair density of stand by the end of the fourth year. Cutting the lucerne in the unopened flower bud stage appeared to hasten slightly the thinning-out effect of the disease, but not to any commercially significant extent. Seasonal temperature also appeared to have a certain bearing on the development of the trouble, but is not believed to be a factor in limiting the latter to the regions in which it exists at present. No relationship could be established between the severity of the disease and type and fertility of soil or the presence or absence of any of its common mineral elements, and the addition to the soil of different fertilizers failed to check the disease and to prolong the life of the lucerne stands. The investigation also indicated that dwarf is largely responsible for the rapid dying of lucerne plants in southern California.

BENNETT (F. T.). **Fusarium patch disease of bowling and golf greens.**—*Journ. Board Greenkeeping Res.*, iii, 9, pp. 79–86, 1933.

Good control of *Fusarium nivale* (*Calonectria graminicola*) on the grasses of a golf green (*Agrostis stolonifera* var. *alba*, *A. tenuis*, *Poa annua*, *Festuca rubra* var., *F. ovina* var., and *Lolium perenne*) [*R.A.M.*, xi, p. 246; xii, p. 754] in the north of England was obtained by regular applications (twice weekly for three weeks before the opening of the playing season, and once a week from May to September) of a combination of Bordeaux mixture and malachite green [ibid., xii, p. 371] at the rate of 3¼ galls. per 150 sq. yds. Laboratory experiments showed that malachite green was completely inhibitory to the growth of *F. nivale* at a strength of 1 to 20,000. The total cost of the combination [full directions for the preparation of which are given] is estimated at £3 10*s.* for a sufficient quantity for nine months' treatment of a green 42 by 42 yds., exclusive of labour, each application occupying one man for four hours.

SUIT (F. R.). **Pseudomonas rhizogenes R.B.W.K. & S.; its host relations and characteristics.**—*Iowa State Coll. Journ. of Sci.*, viii, 1, pp. 131–173, 6 pl., 1 graph, 1933.

Infectious hairy root (*Pseudomonas* [*Bacterium*] *rhizogenes*) [*R.A.M.*, x, p. 166; xi, p. 561] was found present on all of 20 varieties of nursery apple trees examined in five States in North America, the percentage of infection ranging from 1·7 on Delicious trees in Kentucky to 45·2 on Wealthy in Oklahoma. A higher percentage of infection was observed in Kansas and Oklahoma than in Iowa, Kentucky, or Nebraska; the organism occurred most commonly on Wealthy, Yellow Transparent, and Duchess, and was only occasionally found on Jonathan, Delicious, and Stayman.

Bact. rhizogenes induced three forms of abnormal root development: an abundance of fleshy roots (the symptom in the first growing season), hairy or woolly knot (one-year-old hairy root), and clusters of small rootlets on the aerial parts.

The organism was isolated from hairy root on nursery stock of *Spiraea vanhouttei* and *S. prunifolia*, and also from the Flori-

bunda crab-apple (*Pyrus pulcherrima*), but not from the similar condition found on *Lonicera tartarica* and *Symphoricarpos racemosus*. Inoculations gave positive results on sugar beet, tomato, *Chrysanthemum frutescens*, *Bryophyllum calycinum*, *Phaseolus vulgaris*, *Coleus blumei*, apple, *S. vanhouttei*, *L. tartarica*, *S. racemosus*, *Gleditschia triacanthos*, mulberry, peach, *Caragana arborescens*, *Elaeagnus angustifolia*, and *Cotoneaster acuminata* seedlings.

No definite relation was established between host acidity and susceptibility. *Bact. rhizogenes* caused the medium to become acid when lactose, maltose, galactose, xylose, arabinose, or levulose was used as a source of carbon, and can be distinguished from *Bact. tumefaciens* by this means. A table is given showing the differences between these two species. In the field the formation of hairy root on inoculated apple grafts and peach seedlings was influenced more by rainfall than by soil temperature or time of season.

The evidence obtained showed that the most effective way of reducing hairy root on piece-root-grafted apple trees of the varieties studied was by making wedge-grafts and wrapping them with adhesive tape.

A bibliography of 23 titles is appended.

GROVES (A. B.). **A study of the sooty blotch disease of Apples and the causal fungus Gloeodes pomigena.**—*Virginia Agric. Exper. Stat. Tech. Bull.* 50, 43 pp., 10 pl., 3 figs., 1933.

In his investigation, started in 1929, of sooty blotch (*Gloeodes pomigena*) of apples [*R.A.M.*, xii, p. 517] collected from various parts of the United States, the author established the existence of marked differences between many of the specimens both on the fruit and when isolated in pure culture. A closer study of some 180 isolations [the results of which are presented in the form of tables and illustrated by numerous photographs] showed that morphologically the thalli may be grouped arbitrarily into four main types, the distinction between which is not rigid nor based on fundamental characters. These four types are fully described and named, respectively, ramose or peniculate (with much branched thalli); fuliginous (thalli which appear as smoky or sooty smudges); punctate (thalli whose large, conspicuous plectenchymatal bodies give them a distinctly punctate appearance); and rimate (thalli that cause a more or less conspicuous roughening of the apple cuticle). The thalli of the ramose type constituted about 80 per cent. of all those observed. These types do not represent different stages in the development of the fungus, but remain typically constant throughout their growth both on the fruit and in culture. Frequently more than one group may appear on a single fruit, often actually joining, so that thallus variations cannot be a matter of varietal influence from the host nor a response to environmental conditions.

Physiological tests of 30 isolants [isolated by a method which is described in detail], selected because of the visible differences they exhibited, showed that none of them reacted to changes in the

culture media used entirely in the same way as any of the others, but the existence of any definite relationship between thallus type on the apple and differences shown by the isolants in culture could not be established.

In the course of his investigation the author observed several cases of actual disruption of the apple cuticle by the fungus, the initial penetration appearing to be effected by means of a multicellular peg-like structure formed usually under heavy aggregations of mycelium or under the plectenchymatal bodies. The degree of cuticle disruption varies considerably, and the thalli may be separated from this standpoint into three groups, namely, those that penetrate the cuticle by means of the peg-like structure, grow and ramify throughout a few cells near the initial point of penetration, and cause little or no externally visible effect on the fruit; those that make a considerable growth within the epidermal region which is extensively disrupted, all evidence of the penetrating peg being obscured by the large amount of mycelium present; and those that form a more or less extensive ramification chiefly within the intra-cuticular region, although the fungus may at times penetrate further into the fruit. In every case, the organism appears to derive nutritive substances largely from the region of its heaviest growth, and also from the cuticle itself, at least for some time. It was clearly established that the fungus frequently passes right through the cuticle and often enters the epidermal cells. Considerable growth may occur either entirely beneath the cuticle or in the intra-cuticular region. The production of cork cells by the host is often stimulated. These observations are considered to indicate the active though limited parasitic nature of *G. pomigena*.

OGILVIE (L.). **Canker and die-back of Apples associated with Valsa ambiens.**—*Journ. Pomol. and Hort. Science*, xi, 3, pp. 205–213, 1934.

A brief account is given of a die-back of apples which is stated to have been very frequent in the west of England in 1930, and which is considered to have been associated with the exceptionally wet preceding winter. The affected trees bore ascending, wedge-shaped cankers at their base, on which fructifications of a *Cytospora* appeared, and this fungus was also obtained from small cankers on the branches, associated with various forms of injury. Pure cultures of this organism inoculated into healthy apple twigs failed to cause infection, but when a small area of the twigs was slightly charred prior to inoculation, the fungus penetrated several inches into the healthy wood and typical cankers were produced, on which pustules of the fungus developed, followed by the perithecia of *Valsa ambiens* [*R.A.M.*, xi, p. 41]. Single-spore cultures of the latter reproduced *Cytospora* pycnidia with the typical yellow spore tendrils, identical with the fungus isolated directly from cankers. This was determined as *C. ambiens* Sacc. A brief description of both stages is appended.

In reviewing previous references to *V. ambiens* in England, and similar diseases of other host plants associated with species of *Valsa* and *Cytospora*, the author considers that *V. ambiens* is a

weak parasite capable, when established in necrotic areas, of invading healthy tissue to a limited extent.

URBÁNYI (J.). **Fagyás, baktérium, penészgomba, vagy 'majfoltosság'-e az, ami az elraktarozott Almákat károsítja?** [Has the damage observed on stored Apples been caused by frost, bacteria, mould fungi, or 'freckle'?]—*Kisérletügyi Közlemények*, xxxvi, 1–3, pp. 163–171, 7 figs., 1933. [English, Italian, and French summaries.]

Attention is drawn to a severe outbreak of 'freckle' or scald [*R.A.M.*, xiii, p. 108] among stored apples in Hungary in 1932. The chocolate-coloured spots were equally prominent in the green and red parts of the fruit, and on the portions exposed to the sun or protected from it. The smaller lesions were generally limited to the epidermis or the immediately underlying tissues of the rind, while the larger ones penetrated the flesh. The reaction of the different apple varieties to the disorder was quite inconsistent, Jonathan and White Winter Tafota, for instance, being healthy in one locality and heavily damaged elsewhere; other varieties developing scald included the Cassel and Ribston Pippins. The continuously hot, dry weather prevailing during the harvest season is believed to have played a part in the disturbance, which detailed investigation showed was not associated with any parasitic organism. It is considered to be a form of scald.

DILLON WESTON (W. A. R.) & PETHERBRIDGE (F. R.). **Apple and Pear scab in East Anglia.**—*Journ. Pomol. and Hort. Science*, xi, 3, pp. 185–198, 2 pl., 1933.

As a result of spore-trapping experiments in 1932 in the eastern counties of England, the ascospores of *Venturia inaequalis* and *V. pirina* [*R.A.M.*, xiii, pp. 34, 36] were shown to play no part in the early infections of apple and pear trees with scab, which take place before blossoming, since the first ascospores of both fungi were trapped in or near the trees at the end of April and beginning of May, when primary infections by conidia were already well established on the trees. As indicated by field observations, the main source of the early infections was the common presence on the one-year-old fruit spurs and non-fruiting wood of pustules of the fungi, which were found producing conidia very early in the season. In a separate set of experiments it was shown that the conidia are chiefly distributed in splashes of rain, although infection of the developing buds by direct contact with pustules on the one-year-old wood was also observed in some cases. Aphids are also a contributing factor in the spread of infection, since they were shown to carry the conidia of both organisms attached to the hairs on their legs.

A few details are also given of spraying experiments, the results of which showed that scab was more readily controlled, when only one pre-blossom lime-sulphur spraying, in addition to the two post-blossom, was given, on apple varieties that are not susceptible to wood infection (e.g., Blenheim Orange) than on those whose wood is susceptible (Cox's Orange and Worcester Pearmain).

Copper oil Pear wrap to be used.—*Better Fruit*, xxviii, 4, p. 5, 1933.

Anjou pears dispatched from Washington and Oregon are stated to be packed by progressive growers in a special copper oil wrap, known as the 'Hartman wrap', which is claimed effectively to prevent scald and the disease known locally as "nest rot' or 'grey mould' [*Botrytis ?cinerea*: *R.A.M.*, xi, p. 115] on this variety, even if the fruit is packed wet. The wrap is prepared from a basic copper sulphate impregnated in the pulp as the paper is made. Anjou pears so wrapped during transit remain free from both diseases even after being unwrapped for sale.

WILLISON (R. S.). **Peach canker investigations. 1. Some notes on incidence, contributing factors, and control measures.**—*Scient. Agric.*, xiv, 1, pp. 32–47, 1 diag., 7 graphs, 1933. [French summary on p. 52.]

This is a detailed report of experiments from 1928 to the end of 1932 carried out in an experimental peach orchard at St. Catharine's, Ontario, the results of which established the preponderating part played by various traumatic lesions of the bark and by dead stubs following careless pruning and dead twigs such as result from 'die-back' as points of origin for the development of peach cankers [*R.A.M.*, xi, p. 249]. A smaller proportion of the cankers was found to have originated from injuries following *Verticillium* wilt, winter injuries to the collar, dead buds, and broken or split branches. The chief significance of the brown rot fungus [*? Sclerotinia fructicola*: ibid., xiii, p. 33] as a cause of canker is indirect and due to the fact that some of the lesions which it produces on the twigs and branches following blossom and fruit infections may serve as points of entry for canker-producing organisms, e.g. *Valsa* (*Cytospora*) *leucostoma* [ibid., xi, p. 790; xiii, p. 39].

Experiments indicated that while treatment by spraying is effective against brown rot of the fruit and the twig infections associated with it, it apparently does not control the development of the cankers. There was also experimental evidence that peach trees which are overstimulated by cultural practices, with the result that the current year's growth is not sufficiently mature at leaf fall, are more subject to canker than thrifty trees which mature normally. There was some indication of differences in varietal susceptibility among the ten varieties of peach which were tested, but this question needs further investigation.

The paper terminates with recommendations for the prevention of canker, among which special stress is laid on the necessity of a thorough sanitation of the orchards and of the individual trees. Pruning should not be done during the dormant season, but early in the growing season, and may be deferred until late March or April, since pruning wounds made in the spring are less liable to be cankered than the winter ones [cf. ibid., v, p. 503]. Large pruning wounds and cankers, after cleaning, may be disinfected with 1 in 500 mercuric chloride solution and covered with a protective such as white lead paste free from turpentine and with no excess of oil.

SEIDEL (K.). **Zum Kampf gegen Monilia an Sauerkirschen.** [Towards the campaign against *Monilia* on sour Cherries.]—*Obst- und Gemüsebau*, lxxix, 11, p. 174, 1933.

The writer has observed that *Monilia* [*Sclerotinia cinerea*] is most prevalent on the long, thin branches commonly developed by unpruned sour cherry trees [*R.A.M.*, xii, p. 640]. The overloading of the branches with fruit and consequent friction is a common source of channels of infection, which may be eliminated by the removal of superfluous wood.

LINDEGG (GIOVANNA). **Un deperimento dei Ciliegi.** [A wilt of Cherry trees.]—*Riv. Pat. Veg.*, xxiii, 9–10, pp. 347–356, 5 figs., 1933.

This is a preliminary report of the author's histological investigation of a wilt of cherries observed by her in 1933 in the vicinity of Bologna, the symptoms of which agree fully with those of the wilt of plums recently described by Goidanich from various parts of Italy [*R.A.M.*, xii, p. 769], with the exception that the rusty-red lesions on the trunk and branches were marked by heavy exudations of gum, under which the bark was in a rotting condition. While the cause of the disease has not yet been established, the presence was noticed in some of the wood vessels of numerous rod-shaped bodies which were readily stainable and are thought to be probably bacteria.

DODGE (B. O.). **The orange-rust of Hawthorn and Quince invades the trunk of Red Cedar.**—*Journ. New York Bot. Gard.*, xxxiv, 407, pp. 233–237, 2 figs., 1933.

In the course of a survey of red cedar [*Juniperus virginiana*] diseases near Mt. Kisco, New York, in the spring of 1933, several small trees were found to bear a hundred or more separate infections of two or three years' standing by *Gymnosporangium germinale* [*R.A.M.*, xii, p. 704] in addition to many recent ones. Many twigs apparently die off soon after the attack takes place, but if they survive for two to three years they may live for a long time in spite of the fungus, so that the ultimate injury to the cedar tree is slight. The mycelium spreads very slowly and its destructive action is mainly confined to the outermost living cells of the bark. Phytopathologists seem generally to have overlooked the occurrence of long-standing swellings or cankers due to this fungus on the large limbs and main trunk, showing up well after rain as rough blackish rings or patches up to 8 in. in diameter or 1 to 2 ft. long. Some infections on fifty-year-old trees observed by the writer must have occurred on the tip of the main axis at a very early stage in the growth of the host. One of the cankers examined may have been due to the combined action of *G. germinale* and *G. nidus-avis* [ibid., x, p. 634], the former alone not being usually responsible for so much additional wood tissue.

On hawthorns [*Crataegus* spp.] the rust pustules break out all over yellowish swellings on the leaves, fruits, and twigs during the summer.

PRETI (G.). **Sulla ticchiolatura dei frutti del Sorbo domestico 'Sorbus domestica'.** [Note on the scab of the fruits of the Service tree '*Sorbus domestica*'.]—*Riv. Pat. Veg.*, xxiii, 9–10, pp. 371–377, 4 figs., 1933.

A brief account is given of a disease observed during 1933, in the shape of scab lesions on the fruit, leaves, and less frequently on the twigs of the cultivated service tree (*Sorbus domestica*) [*Pyrus sorbus*] in Vallebona, Italy. The causal fungus, the perithecial stage of which was not found, is characterized by brownish-yellow, continuous conidia, rounded at the base and tapering at the apex, 20·3 by 11·6 μ in diameter, borne at the tips of short, erect, brown, unbranched, unicellular conidiophores, measuring 29 to 35 by 8·7 μ; it agrees closely with the description of *Fusicladium dendriticum* var. *sorbinum* Saccardo, with which it was identified.

HARRIS (R. V.). **Mosaic disease of the Raspberry in Great Britain. I. Symptoms and varietal susceptibility.**—*Journ. Pomol. and Hort. Science*, xi, 3, pp. 237–255, 3 pl., 1934.

This is a progress report of an investigation, started in 1921 at the East Malling Research Station, of the symptomatology of raspberry mosaic in England, some details of which have already been noticed from previous communications [*R.A.M.*, viii, p. 184; xii, p. 771]. The only symptoms by which mosaic can be distinguished from other diseases of raspberry are a yellowish mottling or speckling of some of the leaves of affected stools, associated with different degrees of leaf curling, twisting, or distortion, most usually seen on first-year canes. These symptoms are not visible on the first leaves unfolded in the spring; they have been observed as early as the end of April, but in most seasons they become apparent on the fruiting canes in the middle of May and not until early June on the canes of the current year's growth. The mottling does not appear on all the leaves of an affected stool, and in some varieties, e.g., Baumforth Seedling B, a zonation of intermittent development of the symptoms has frequently been observed, though almost invariably in such cases the last leaves to unfold in the season are mottled.

The range of leaf symptoms which has been observed in an extensive collection of raspberry varieties at East Malling is classified under three main symptom types; (*a*) mottling distributed evenly over the entire leaf surface, chlorotic patches not appreciably sunken and not associated with any curling or distortion of the laminae; (*b*) chlorotic patches ill-defined, tending to aggregate towards the leaf margins and between the main veins, slightly sunken and accompanied by a symmetrical down-curling of the laminae about the midrib, the symptoms varying in intensity on individual leaflets of a single leaf and being masked by high summer temperature conditions; (*c*) chlorotic spots sharply defined, deeply sunken or embossed, scattered, and associated with an asymmetrical twisting or crumpling of the laminae, these symptoms not being masked by high summer temperatures. More than one of these three types may occur on the same variety, sometimes even on the leaves of a single stool. In some varieties, e.g., Lloyd

George, Pyne's Royal, and Superlative, a classification cannot be made from observation alone, but must depend ultimately on some method of analysis such as grafting; an investigation started on these lines in 1928 gave some evidence that the types of mosaic described above may be related to two distinct forms of mosaic, a discussion of which is reserved for the future.

From field observations over a ten year period at East Malling, the author submits a tentative classification of raspberry varieties according to their relative apparent susceptibility (i.e., rate of degeneration after infection) and their apparent infectibility (Rankin's term 'klendusity', i.e., rate of spread of initial infection). In dealing with the problem of commercial control of the disease by roguing [loc. cit.], the necessity is stressed of a careful study of all the symptoms exhibited by a given variety at different times and under varying seasonal and weather conditions, since, besides the masking caused by high temperatures, the symptoms are also temporarily masked if the leaves are wet or are observed in direct sunlight.

The paper is prefaced by a brief review of the literature dealing with raspberry mosaic in America [ibid., xii, p. 770], from which it appears that the two main types (yellow mosaic and red raspberry mosaic) known there exhibit certain distinguishing characters in common with the two principal symptom types occurring on the red raspberry in England. A final comparison can only be made by cross-inoculation experiments by grafting methods under uniform conditions.

SMITH (C. O.). **Some inoculations with Dothiorella ribis.**—Abs. in *Phytopath.*, xxiii, 11, p. 929, 1933.

The following are some of the 25 woody plants successfully inoculated through stem wounds with strains of *Dothiorella* [*Botryosphaeria*] *ribis* [*R.A.M.*, xii, p. 283] from walnut (*Juglans regia*) and avocado (*Persea americana*) [*P. gratissima*]: orange, lemon, grapefruit, four varieties of walnut, *Carya pecan*, loquat, Mammoth blackberry, plum, cherry (*Prunus avium*), *Diospyros kaki*, avocado, olive, *Psidium guajava*, willow (*Salix* sp.), elm (*Ulmus campestris*), and oak (*Quercus lobata*).

WILCOX (R. B.) & BECKWITH (C. S.). **A factor in the varietal resistance of Cranberries to the false-blossom disease.**—*Journ. Agric. Res.*, xlvii, 8, pp. 583–590, 1 fig., 1933.

A brief account is given of tests [by a method which is described], the results of which are considered to indicate that the degree of susceptibility exhibited by certain varieties of cranberry to false blossom [*R.A.M.*, xiii, p. 41] is directly correlated with their degree of attractiveness to the leafhopper [*Euscelis striatulus*] vector of the disease. This attractiveness appears also to be similarly correlated with the relative rate of spread of false blossom under field conditions observed during several years in the five differential varieties used in the tests. The apparent resistance of some varieties to the disease seems to consist, at least in part, of their resistance to the insect vector.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Cultivation and diseases of the Banana in Brazil.**—*Trop. Agriculture*, x, 7, pp. 192–197; 8, pp. 211–217; 9, pp. 255–259, 6 pl., 1933.

In this account of their observations of the diseases of bananas in the State of São Paulo, Brazil, the authors describe a bacterial wilt which in recent years has affected the Cavendish and Giant Fig varieties in the vicinity of Santos. On Cavendish the first symptom was a yellowing of the leaves, beginning with the lower ones, which later assumed a marked dingy or whitish-yellow tint, and became dry, flaccid, and drooping, and ultimately the plants rotted and collapsed. Young suckers from diseased plants showed browning and shrivelling of the leaf blades. Generally, the plants were not attacked until they were well grown, but once the leaf symptoms appeared little or no further development of the bunch took place. On Giant Fig the symptoms were similar, except that the leaf discoloration was lighter and the leaf margins not uncommonly turned brown; on this variety the disease appeared only at a late stage of growth, and well-grown daughter plants were quite healthy.

Yellow vascular discoloration was present in only a few of the outermost leaf sheaths, when infection had reached an advanced stage. In many plants showing five or six yellowish leaves the rhizome tissue appeared to be healthy, except for a pale yellow discoloration near the periphery of the stele; only when defoliation was almost complete was any conspicuous yellowing present at the periphery of the vascular ring. In the apex of plants so affected the vascular strands were pale blue and watery, softer dark areas indicating the formation of bacterial cavities in the parenchymatous tissues.

From its size, shape, cultural characters, and its ability to live in the vascular tissues of Solanaceous plants the organism consistently isolated from the affected vascular strands is provisionally referred to *Bacterium solanacearum*. It was successfully inoculated into tomato plants causing them to wilt, and re-isolated from the tissues at a distance from the seat of inoculation.

The disease occurred in isolated stools surrounded by healthy ones, spread to one, or at most two neighbouring stools, occurring during the year; in some instances considerable areas were attacked simultaneously, the plants being killed out in no definite succession in a few months. Its tendency to spread on humus-laden soils near the mangrove mud flats is regarded as serious, as some of these areas are highly productive. Directions are given for controlling the wilt by killing the roots of affected plants *in situ* with heavy gas oil [*R.A.M.*, xiii, p. 111] and by liming and aerating the soil.

In one plantation a characteristic leaf mottling of the suckers was observed, light, chlorotic broken stripes extending from the midrib to the leaf margin and later becoming yellowish- or brownish-red. The symptoms became progressively intensified on the younger leaves. Some leaves bore the mottling over their entire surface, while on others infection appeared in localized bands. The distribution of healthy and affected plants suggested that the disease was infectious and was transmitted by an insect with a

short flight range. Similar leaf markings were later found in widely separated localities on Cavendish and Giant Fig. It is considered that the disease, which in some respects resembled that reported by Magee from New South Wales [ibid., x, p. 472], is probably an infectious chlorosis due to a virus. The aphid *Pentalonia nigronervosa*, which transmits banana virus diseases [ibid., xi, p. 157; xiii, p. 111], was much in evidence.

On several plantations a brown bulb rot of Cavendish and Giant Fig appeared to have been present for some years. Though fatal to the individual plant it did not spread rapidly from stool to stool. It was usually found on areas recently reclaimed from virgin forest, and involved either individual stools or patches of twenty or more. On the Cavendish variety the plant as a whole looked unhealthy; the leaves were yellow, without marginal discoloration or withering, but deep yellow bands sometimes extended from the midrib to the margin. The older leaves withered very slowly, turned brown and broke down at the point of junction with the trunk, the younger leaves showing numerous secondary leaf spots; plants with advanced infection still carried a fair crown. On the Giant Fig variety the leaves in general were discoloured, but a marginal yellowing followed by browning was characteristically present and the disease progressed more rapidly than on Cavendish. With both varieties advanced infection was marked by complete rotting of the bulb, and the plants could easily be pushed over. Infection began at the base of a sucker or bulb and progressed upwards towards the apex. At the upper extremity of the infection the sucker tissue showed pale orange, yellow or brownish, water-soaked areas bounded at the edge of the healthy tissue by a dark red, undulating line, forming finger-like projections. In the older infected parts the tissue became brownish, while lower down, in the still more severely affected parts the tissue was pale amber and of a waxy consistency. The affected bulbs smelt strongly of mushrooms. It is provisionally suggested that the rot (which is not a source of serious loss) is due to a fungus belonging to the Agaricaceae or Polyporaceae.

A few unimportant infections by *Marasmius semiustus* [*M. stenophyllus*: ibid., vii, p. 703; xi, p. 97] were noted.

Most of the leaf spot observed (of which very little was present) was due to *Scolecotrichum musae* [considered by v. Höhnel to be a *Cordana*: ibid., iii, p. 103; xii, p. 458].

PARK (M.). **Panama disease of Plantains.**—*Trop. Agriculturist*, lxxxi, 5, pp. 330-333, 1933.

Panama disease of plantains (*Fusarium oxysporum cubense*) was first identified in Ceylon in 1930 [*R.A.M.*, x, p. 472; xii, p. 77] and has since been observed in a number of widely separated localities in the island, its distribution indicating that it is not new to Ceylon, where it is well established but seldom assumes serious proportions.

Inoculation experiments demonstrated that the incubation period is usually eight, but may extend to thirteen, months, and during this period suckers from infected stools may carry the disease, one

severe outbreak near Colombo [ibid., xiii, p. 78] being probably due to this source of infection.

In Ceylon the disease is severe only in localities where plantains are grown under adverse conditions of soil or cultivation; in some areas outbreaks are commonest after floods.

Brief notes are given on prevention and control by the use of healthy planting material and the destruction of the roots of diseased plants by means of a toxic oil [ibid., xiii, p. 111].

WARDLAW (C. W.) & MCGUIRE (L. P.). **Banana storage. An account of recent investigations into the storage behaviour of several varieties.**—*Empire Marketing Board Publ.* 72, 40 pp., 4 pl., 1933.

In this report of storage trials of various types of bananas at the Low Temperature Station, Trinidad, it is stated that a new hybrid I.C. 2 [cf. *R.A.M.*, xi, p. 383] has been ascertained to be highly resistant to or actually immune from Panama disease [*Fusarium oxysporum cubense*]. Like Gros Michel it resists bruising and ripens to an attractive colour. The flesh is also of good texture and superior flavour to I.C. 1. The bunches obtained (on relatively poor soil) were small, and the fingers short, thick, and closely packed.

For the first time during these storage trials in Trinidad pitting disease [*Piricularia grisea*: ibid., xi, p. 728] was present, the varieties affected being Giant Governor and Governor [both varieties of *Musa cavendishii*]; Gros Michel showed a very mild, economically unimportant infection.

CONDIT (I. J.) & HORNE (W. T.). **A mosaic of the Fig in California.**—*Phytopath.*, xxiii, 11, pp. 887–896, 4 figs., 1933.

An expanded account is given of the writers' study on fig mosaic in California, a brief notice of which has already appeared [*R.A.M.*, xii, p. 382]. The leaves show light yellow spots, sometimes sharply delineated, but more usually shading into the dark green of the healthy parts. In the former case there may be a rust-coloured necrotic band around the spot, but general necrosis of the latter was not observed. On the fruit the symptoms are similar. Of the five leading commercial varieties, Kadota and Calimyrna are little affected, White Adriatic and Brown Turkey are sufficiently resistant under good cultural conditions, while Mission suffers severely. In an experimental planting of over 100 varieties at Riverside, only one has shown virtual immunity—an entire-leaf caprifig form of *Ficus palmata*, but a high degree of resistance has been shown by Biskra, Hamma, Pastiliere, and a lobed-leaf form of *F. palmata*. Among the more susceptible varieties may be mentioned Ischia, Celeste, Cheker Injir, Baalie, Panache, Roeding No. 3, De Jerusalem, and Sultane.

BAKER (R. E. D.). **Papaw root and collar-rot.**—*Trop. Agriculture*, x, 11, pp. 328–329, 1933.

The results of inoculations with single spore cultures from isolations made by G. C. Stevenson of a *Fusarium* and a *Pythium* from

collar rot of *Carica papaya* in Trinidad [cf. *R.A.M.*, xi, p. 330] showed that in a stem wound the former fungus killed 11 out of 24, and the latter 8 out of 24 plants inoculated; when inoculated into the roots the *Fusarium* killed none and the *Pythium* 1 out of the 12 plants tested with each fungus.

It is concluded that both organisms, when favoured by exceptional humidity at the base of the trees, are capable of killing *C. papaya*. In a normally dry season special control measures are superfluous, but during an unusually wet spell the base of the trees should be bared and drainage attended to.

SWARBRICK (T.). **Spraying technique.**—*The Fruit-Grower*, lxxvi, 1978, pp. 813–815, 1933.

An account is given of the leading principles underlying the fruit tree spraying technique that has been evolved at the Long Ashton Research Station, Bristol, since 1927 [*R.A.M.*, xiii, p. 103]. The subject is discussed under the headings of quantity and time factors, labour problems, spraying machines, adjustable and fixed nozzles, coarse v. fine mist sprays, quantity of wash, high working pressures, and form of spray outfit. Much importance is attached to the use of high working pressures (350 to 400 lb.), spray guns with replaceable disks, a 'penetrating' spray, and a 'mobile' as opposed to a stationary system of application. In the writer's opinion, no hope of successful economical and consistent pest and disease control can be entertained unless the complete spraying programme can be carried out in five working days.

LINK (G. K. K.). **Etiological phytopathology.**—*Phytopath.*, xxiii, 11, pp. 843–862, 1933.

A general survey is given of the etiological aspect of phytopathology, which is treated in the broadest sense to include all the consequential antecedents of plant diseases. These are classified under the headings of internal or constitutional pathogenic factors, past history and correlative influences, external pathogenic factors, and external agents, living and non-living. A thoroughgoing etiological pathology considers all possible antecedents of the diseased condition and not merely, as is too often the case, the single immediate cause (such as the attack of a parasite) which incites the disease.

GRAINGER (J.). **Virus diseases of plants.**—104 pp., 6 pl., 6 figs., 2 graphs, Oxford University Press, 1933.

This book is intended as a simple text-book for the student of mycology or plant pathology, and contains mainly an account of the phenomena associated with virus diseases, rather than descriptions of a large number of these diseases. The subject-matter is arranged under chapter headings which include the following: the relations of a virus to its host, properties of the virus extract, the relations of insects to virus diseases, economic effects and control, and the classification and description of virus diseases. There is a bibliography of 445 titles.

SASSUSCHIN (D.). **Zum Studium der Parasiten vom Typus Protozoa bei Pflanzen des Südostens RSFSR.** [Contribution to the study of parasites of the protozoal type in plants of the south-east of the U.S.S.R.]—*Zool. Anzeiger*, ciii, 11–12, pp. 304–306, 1 fig., 1933.

Flagellates measuring 10 to 23 by 1·5 μ (flagellum 7 to 10 μ) were detected in the latex of 6 per cent. of the *Euphorbia uralense* plants investigated by the writer in the Saratov district of south-eastern Russia in 1929 and 1930. A more comprehensive examination in the latter year of 587 bushes revealed the flagellate (identified as *Phytomonas* [*Leptomonas*] *davidi*) [*R.A.M.*, vi, p. 437] in 10·7 per cent. The parasites were commonly located near the flower buds; owing to their extreme motility their structure was difficult to determine, but the characteristic spiral form was observed in a number of cases. In fixed preparations stained by the Romanowsky-Giemsa technique the organism could be studied in various stages of development and division. The nucleus is situated near the front of the body. The infected plants were yellow and wilted and inoculation experiments with the flagellate on healthy bushes induced the typical symptoms in 4 to 15 days.

HORN (K.). **Mykorrhizasopp som hekseringdanner.** [Mycorrhiza fungus as a producer of fairy rings.]—*Friesia Nord. Mykol. Tidsskr.*, i, 2, pp. 81–83, 2 figs., 1933. [English summary.]

In 1932 *Hebeloma crustuliniforme* was observed forming fairy rings in the grass (mostly consisting of *Alopecurus pratensis*, *Dactylis glomerata*, and *Poa pratensis*) round young birches (*Betula lenta*) in the Oslo (Norway) Botanic Garden. On examining the root systems of the trees the fungus was found in mycorrhizal association with them, occupying the outer tissues of the absorbing roots, the aspect of which agreed with Melin's description of birch mycorrhiza [*R.A.M.*, iii, p. 358]. *H. crustuliniforme* is stated to be prevalent in east and west Norway wherever birches are grown.

BROWN (R.). **Nitrogen fixation by the endophyte of Lolium.**—*Journ. Agric. Sci.*, xxii, 4, pp. 527–540, 2 figs., 1933.

After a review of the literature relative to the endophytic fungus of *Lolium* [*R.A.M.*, v, p. 379 *et passim*] and to the problem of its capacity of fixing or assimilating free atmospheric nitrogen [ibid., xii, p. 779], the author describes in detail experiments in which he grew *Lolium perenne* from surface sterilized commercial seed under strictly controlled conditions on synthetic media with and without the addition of nitrate, and also in an atmosphere in which nitrogen was replaced by oxygen. At the end of eight weeks the results showed that the poorest growth was made by the plants without nitrate in the culture medium, as indicated by the fact that they had a leaf length of only 21·5 cm. and a dry weight of 0·00148 mg., as compared with 26·4 cm. and 0·0018 mg., respectively, in the nitrate medium. Absence of nitrogen from the atmosphere had a still further depressing effect on the seedlings in the former solution, as their leaf length was reduced to 18 cm.

and their dry weight to 0·00136 mg. The author's data are considered to indicate that *L. perenne* does meet some, but only a part, of its nitrogen requirements from atmospheric sources, especially when nitrogen in the combined form is absent from the nutrient medium. The presence of a considerable quantity of urea in the *Lolium* roots infected by the endophyte, as well as certain morphological details of the latter, would indicate a continuous transference of nitrogenous material from the endophyte to the host during the period of growth.

FREISLEBEN (R.). **Über experimentelle Mykorrhiza-Bildung bei Ericaceen. (Vorläufige Mitteilung.)** [On experimental mycorrhiza formation in Ericaceae. (Preliminary note.)]—*Ber. Deutsch. Bot. Gesellsch.*, li, 8, pp. 351–356, 1 pl., 1933.

From the roots of *Vaccinium myrtillus* in Saxony the writer isolated an endophytic fungus in hanging drops of malt agar. In order to determine the effect of the endophyte on the plants, bilberry seeds were divided into four groups, of which (1) was extracted aseptically from the berries but not disinfected, and grown in Erlenmeyer flasks on a mixture of peat mould and sand inoculated with the fungus; (2) was similarly treated but without inoculation; (3) was surface-disinfected with 0·1 per cent. mercuric chloride and the substratum inoculated; and (4) as (3) but without inoculation. For the first three or four weeks all the plants made about equal growth, but thenceforth differences became noticeable, the inoculated groups (1) and (3) developing vigorously and completely filling the flasks after three to five months, whereas the uninoculated controls made practically no growth. The root system of the former groups was profusely branched and almost white, in marked contrast to the dark brown stumps, only 1 to 3 mm. long, of the latter. Microscopic examination showed that the lateral roots of the inoculated plants were completely transformed into endotrophic mycorrhiza fully equalling those observed in nature. In opposition to M. C. Rayner's results [*R.A.M.*, viii, p. 455], no trace of mycelium could be detected in the tissues of the shoots of the plants, even those of the uninoculated group of seedlings from not disinfected seed [cf. ibid., xi, p. 317].

No definite statement can be made at the present stage of the investigations with regard to the distribution of endophytes in the shoots and berries of the Ericaceae, but it seems evident that their presence in the aerial portions of Ericaceous plants is less general than M. C. Rayner assumes. It is also not yet possible to assign the root fungus to its correct systematic position owing to the absence of fructifications, and the provisional name of *Mycelium radicis myrtilli* is therefore proposed. A full description of the fungus is reserved for later publication, but meanwhile attention is briefly drawn to the penetration of the infected cortical root cells in culture by hyphae, some 50 per cent. of which are enveloped in cuff-shaped thickenings formed by the host cells and evidently of similar origin to the 'boxes' observed by Burgeff (Saprophytismus und Symbiose, Jena, 1932) in the Orchidaceae. No such structures have hitherto been described in connexion with the mycorrhiza of the Ericaceae, although they also occur in a

somewhat less conspicuous form in nature, and were further detected in *V. vitis-idaea* and *V. uliginosum*.

DICKSON (H.). **Saltation induced by X-rays in seven species of Chaetomium.**—*Ann. of Botany*, xlvii, 188, pp. 735–754, 2 col. pl., 24 figs., 3 graphs, 1933.

The experiments described in detail in this paper were made to ascertain whether the ready response by saltation exhibited by *Chaetomium cochlioides* when exposed to the action of X-rays reported in a previous communication [*R.A.M.*, xi, p. 593] was shown by other species of the genus, of which six [named] were tested. Saltation was induced by the treatment in all the seven species; comparatively infrequently in four, while the other three saltated very readily. Control cultures of the fungi indicated that the parent strains of five of the species are quite stable when not subjected to irradiation, but saltants were very occasionally produced by the un-irradiated cultures of *C. fieberi* var. *rufipilum* and *C. murorum*. The variant characteristics of the various species are described, with figures of the saltant perithecia, and notes are also given on the effect on growth form and rate of growth of the saltants and their parent strains, of variations in the culture medium, the reactions showing some points of similarity with those obtained by Brown in his work with species of *Fusarium* [ibid., iv, p. 627].

SMITH (H. R.) & CAMERON (E. J.). **Mold growth test for minute amounts of arsenic.**—*Indus. & Engin. Chem.*, Analyt. Ed., v, 6, pp. 400–401, 1933.

Full details are given of a method, based on the liberation of arsenic in gas form by *Scopulariopsis brevicaulis* (*Penicillium brevicaule*) [*R.A.M.*, xii, p. 714], for the detection of minute quantities (down to 1 p.p.m.) of arsenic in food samples.

SATOH (S.). **Studien über die Wirkungen der durch Ophiobolus miyabeanus gebrauchten Nährlösungen auf die Keimung und Entwicklung eines anderen Pilzes.** [Studies on the effects of nutrient solutions utilized by *Ophiobolus miyabeanus* on the germination and development of another fungus.]—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 71–83, 2 graphs, 1931. [Japanese with German summary. Received February, 1934.]

Two kinds of substances are stated to be formed in the culture liquid of *Ophiobolus miyabeanus* [an important parasite of rice in Japan: *R.A.M.*, xii, p. 532], one of which accelerates and the other retards the germination and growth of *Aspergillus niger*. The former traverses a Chamberland filter (F) but not the latter. The inhibitory effect is more readily counteracted by dilution of the solution than the growth-promoting influence. The chemical composition of the substances was not determined, but that with an accelerative action was found to be thermostable while the substance retarding development in *A. niger* speedily succumbed to heat. Both substances appear to produce their maximum effects on *A. niger* during its first week of growth.

MORWOOD (R. B.). **Potato diseases.**—*Queensland Agric. Journ.*, xl, 5, pp. 382–395, 4 pl., 1933.

Brief, popular notes are given on the symptoms, causes, and control of the following potato diseases occurring in Queensland: blight (*Phytophthora infestans*), target spot (*Alternaria solani*), wilt (*Fusarium oxysporum*), dry rot (*F.* spp.), bacterial wilt (*Bacterium solanacearum*), blackleg [*Bacillus phytophthorus*], scab [*Actinomyces scabies*], black scurf (*Corticium solani*), the minor root and stem rots due, respectively, to *Armillaria mellea* and *Sclerotium rolfsii*, and common virus and physiological diseases, as well as on powdery scab (*Spongospora subterranea*) and wart disease (*Synchytrium endobioticum*), neither of which has been recorded in the State. The paper concludes with recommendations for securing a healthy crop, and instructions for making and using hot formalin solution and Bordeaux and Burgundy mixtures.

FOLSOM (D.). **Potato virus diseases in 1932.**—*Amer. Potato Journ.*, x, 11, pp. 224–233, 1933.

Recent American and European literature (1931–2) on potato virus diseases is briefly reviewed on the lines of previous surveys [*R.A.M.*, xii, p. 187]. Many of the papers referred to have been noticed from time to time in this *Review*.

MCKAY (M. B.), DYKSTRA (T. P.), MORRIS (H. E.), YOUNG (P. A.), RICHARDS (B. L.), & BLOOD (H. L.). **Virus and viruslike diseases of the Potato in the Northwest and their control.**—*U.S. Dept. of Agric. Circ.* 271, 32 pp., 8 pl., 19 figs., 2 plans, 1933.

In this paper the authors give a full account in popular terms of the more important results of practical value obtained after several years' study of the virus and virus-like diseases of potatoes in the north-western parts of the United States. The material is arranged under such headings as general characteristics of potato virus diseases, types of such diseases (including mild, crinkle, rugose, leaf-rolling and other forms of mosaic, calico, leaf roll, witches' broom, psyllid yellows, spindle tuber, and giant hill), agents of spread, and control by the isolated seed-plot method.

CLINCH (PHYLLIS) & LOUGHNANE (J. B.). **A study of the crinkle disease of Potatoes and of its constituent or associated viruses.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 37–40, pp. 567–596, 2 pl., 1933.

This is a full account of the authors' studies [a preliminary report of which has already been noticed: *R.A.M.*, xii, p. 717] of the potato virus diseases belonging to the mosaic group, namely: simple mosaic, the crinkle complex, identical with Salaman's crinkle A [ibid., xi, p. 739] and its constituents virus A [ibid., xi, p. 740] and either simple or interveinal mosaic, and Up-to-Date streak, which combined with virus A also produces a type of crinkle. The characteristics of these diseases are briefly described. Experiments showed that simple mosaic is inoculable by needle (but is not transmissible by *Myzus persicae*) to tobacco, *Datura*

stramonium, and certain other Solanaceous hosts, and also to other potato varieties, including Arran Crest, in which it causes top necrosis. Crinkle A was transmitted in full from potato to potato by grafting, but needle inoculations only transmitted one of the constituents of the complex, namely, a simple mosaic which is termed mosaic *ex* C; when crinkle A was inoculated by needle into tobacco, *Datura stramonium*, *Nicandra physaloides*, or *Petunia* sp., and returned thence to President potato, a simple mosaic was obtained, which is considered to be identical with mosaic *ex* C. The latter corresponded to simple mosaic in its general reactions, the differences between the two observed so far being in degree rather than in kind.

The second constituent of crinkle was transmitted by grafting (but not by needle) and by *M. persicae* from potato to potato, and caused a transient veinal mottle in President and top necrosis in British Queen and Up-to-Date, all the evidence pointing to its identity with the A virus which occurs naturally in an almost latent condition in Irish Chieftain potato. It was shown to be transmissible by the aphid and by needle to tobacco, in which is caused green vein-banding, but could not be returned by needle from tobacco to potato; it was transmitted to *D. stramonium* by grafting, but all attempts to inoculate it by needle into this host or a number of other solanaceous plants failed. A crinkle, identical in its symptoms with that occurring in nature, was reproduced when virus A was combined with mosaic *ex* C in healthy President potato plants. Interveinal mosaic was shown to agree in most of its reactions with mosaic *ex* C, and also reproduced crinkle when combined with virus A in President, identical in its foliage symptoms with the natural disease but with the addition of lesions characteristic of interveinal mosaic in President.

The latent acronecrotic streak virus of Up-to-Date was shown to be filterable and inoculable by needle to tobacco and *D. stramonium*, and to be transmissible from the latter to potato by grafting, but not by the needle. It was, however, transmitted by needle from Up-to-Date to Arran Crest potatoes, in which it produced top necrosis. The experiments suggested the presence in the stock of Up-to-Date used of only one virus entity, that of acronecrotic streak.

The results of this investigation [which are very fully discussed] lead the authors to believe that crinkle A is a mixture, rather than a compound, of two viruses, each of which belongs to a distinct type. The A virus is of a similar type to Smith's Y virus [ibid., xi, p. 394], though definitely distinct from the latter, while the *ex* C virus corresponds to Smith's X type. They also suggested that all the viruses dealt with are separable into two natural groups, of which the X and Y viruses may be considered to be the types.

TUCKER (J.) & HARBER (E. W.). **Seed treatment for Potato black-leg.**—*Scient. Agric.*, xiv, 2, pp. 70–72, 1933. [French summary on p. 107.]

Official reports [a general summary of which is given in two tables] received from 1928 to 1932, inclusive, from all the repre-

sentative potato-growing areas of Canada, showed that during the period under review blackleg [*Bacillus phytophthorus*: *R.A.M.*, xii, p. 719] caused an average loss of crop of 0·34 per cent. in 23,959 fields sown with certified untreated seed, while in 13,218 and 6,846 fields sown with seed treated with mercuric chloride and formalin, respectively, the loss was 0·18 and 0·31 per cent. These results would indicate that the cost of treating the certified seed is not warranted from a purely economic standpoint, except in localities where conditions are particularly favourable for the development of the disease.

KIESSLING (L. E.). **Wachstumsverlauf von Actinomycetenstämmen und seine quantitative Bestimmung auf verschiedenen Kartoffelnährsubstrat.** [The growth process of strains of Actinomycetes and its quantitative determination on different kinds of Potato medium.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 8-12, pp. 177–196, 1 graph, 1933.

A detailed and fully tabulated account is given of the writer's experiments to determine the influence of the potato variety used in the composition of the medium on the growth of various species and strains of Actinomycetes, including pure cultures of *Actinomyces scabies*, *A. flavus* [*R.A.M.*, xii, p. 783; xiii, p. 50], *A. chromogenes* [ibid., x, p. 381], *A. setonii*, and *Nocardia odorifera* from the Centraalbureau voor Schimmelcultures, Baarn, Holland, and two strains (A and B) of *Actinomyces* isolated from compost. The fungi grew well on a substratum consisting of one part of the expressed juice of potato tubers or stems to two of an appropriate synthetic solution.

Electrometrical determinations of the changes induced by the Actinomycetes in the reaction of the medium showed that, with the exception of *A. flavus* and *N. odorifera*, all the strains caused a marked increase of alkalinity. Well-marked differences were apparent in the quantity of the mycelium formed during growth on the expressed juices of 14 standard potato varieties, the smallest amounts being produced on the juice of the early ripening sorts. It is evident from the author's results that the Actinomycetes are sensitive to differences in the composition of the expressed juices conditioned by varietal characters, stage of maturity, and origin.

MÜLLER (K. O.). **Über die Biotypen von Phytophthora infestans und ihre geographische Verbreitung in Deutschland. (Vorläufige Mitteilung.)** [On the biotypes of *Phytophthora infestans* and their geographical distribution in Germany. (Preliminary note).]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 11, pp. 91–92, 1 map, 1933.

The writer's laboratory experiments with isolations of *Phytophthora infestans* collected from widely separated localities of Germany during 1932 have confirmed the occurrence of biologic specialization within the species [*R.A.M.*, xiii, p. 179], which may be divided into three main groups, viz. (1) the ubiquitous A type capable of attacking the standard commercial varieties but not the 'W' strains; (2) the S type, parasitic both on standard varieties and

'W' strains but not on *Solanum demissum* and its hybrids with *S. tuberosum*; (3) transitional types infecting the tubers of the 'W' strains more severely than type A but not attacking their foliage in the greenhouse after a week's incubation. It is noteworthy that the S biotype of *P. infestans* is restricted to those localities of north Germany and Bavaria in which potato seed selection establishments are situated, affording ample opportunity for unchecked propagation on the 'W' strains. The transitional type has been found mainly in East Prussia, the Thuringian Forest, and the Eifel. Undue importance should not be attached to the unexpected susceptibility of the 'W' strains to the new biotype of *P. infestans*, since resistance to the widespread A type is the main practical consideration. Some years must certainly elapse before the S type gains a firm footing in the country, and in the meantime its extension must be combated by the development of the *S. demissum* hybrids.

NAPPER (MAUDE E.). **Observations on Potato blight (Phytophthora infestans) in relation to weather conditions.**—*Journ. Pomol. and Hort. Science*, xi, 3, pp. 177–184, 1933.

The results of the experiments briefly reported in this paper showed that conidia of *Phytophthora infestans* produced on potato leaves with a very high water content kept in a saturated atmosphere will not germinate immediately after removal from the saturated chamber but will do so if gathered after the water content of the host tissues has been reduced by about 4 to 18 per cent. of the maximum by exposure to dry air. As in the experiments with *Cystopus candidus* [*R.A.M.*, xiii, p. 70] it was assumed that in the desiccation process the conidia of *P. infestans* lost an amount of water approximately equal to the reduction in the water content of the host tissues, as indicated by the fact that conidia attached to the host do not dry out until the host cells are dry. In further experiments it was shown that the rate of mycelial growth of the fungus in inoculated leaves and the production of conidia vary directly with the water content of the host tissues both in resistant (e.g., President) and in susceptible (e.g., Up-to-Date) varieties. The general conclusions drawn from these results indicate that the successful establishment and development of the blight depend chiefly upon weather conditions, a period of heavy rainfall, high relative humidity, little wind, and a moderate temperature being the main predisposing factors. The attack is intensified if this period is broken by a short spell of dry weather followed closely by wind and rain or heavy dew, and may attain epidemic form if this sequence of events is repeated.

DU PLESSIS (S. J.). **Die morphologiese eienskappe en die parasitisme van verskillende Fusaria op Aartappels.** [The morphological characters and parasitism of various species of *Fusarium* on Potatoes.]—*Ann. Univ. Stellenbosch*, xi, Ser. A, 3, 24 pp., 8 figs., 1933. [English summary.]

Wilt disease of potatoes in South Africa is stated to be mainly due to *Bacillus* [*Bacterium*] *solanacearum*, with which are sometimes associated species of *Fusarium*. The following have also

been isolated from potato tubers affected by dry, wet, or stem-end rots: *F. bulbigenum* var. *blasticola*, *F. orthoceras* and its var. *albido-violaceum*, *F. oxysporum* and its form 1 [*R.A.M.*, xiii, p. 128], *F. coeruleum*, *F. solani*, *F. sambucinum*, and *F. argillaceum* [ibid., xii, p. 317]. Full descriptions are given of the cultural and morphological characters of these species, of which the first five (all in the Elegans section) were found to be the most important potato tuber-rotting agents. On inoculation into Up-to-Date tubers *F. oxysporum* form 1 produced a dry rot and *F. bulbigenum* a semi-watery type of decay. Greenhouse inoculations with all the species on the wounded stems of healthy plants gave negative results.

ROSEN (H. R.). **Influence of spray applications on air temperatures surrounding sprayed Potato plants.**—*Phytopath.*, xxiii, 11, pp. 912–916, 1 graph, 1933.

In a four-year study of the factors responsible for the injury caused by 4-4-50 Bordeaux mixture in southern Arkansas to potato plants sprayed against tipburn [*R.A.M.*, ix, p. 266] it was found that the application of the fungicide is generally accompanied by sudden and precipitous drops in the surrounding air temperature, ranging from 1·5° to 8° C. The effect of such abrupt temperature changes on the health of the plants has not been studied, but the present observations suggest that the midsummer spraying of plants in the warmer regions of the United States is attended by greater risks of injury than in the cooler districts.

FUKUSHI (T.). **Transmission of the virus through the eggs of an insect vector.**—*Proc. Imper. Acad. Sci.*, Tokyo, ix, 8, pp. 457–460, 1933.

In the course of studies on the transmission of the virus of rice dwarf in Japan [*R.A.M.*, xi, p. 324], the writer confined pairs of male and female leafhoppers (*Nephotettix apicalis* var. *cincticeps*), the insect vector of the disorder, on healthy young rice plants in glass tubes, each couple remaining on a plant for one day before transference to a new one. The females used were nymphs which were separately confined until they became adult so as to avoid risk of outside copulation, and in some of the experiments both they and the males were separately confined on diseased plants to render them infective. After pairing, the eggs were laid by the female in the leaf sheath and thrust transversely into the tissue, hatching out after about ten days. On emergence the nymphs were immediately transferred, before they had time to feed, to healthy plants and kept under observation for two months or longer. Successful transmission of rice dwarf in the ensuing numerous tests was obtained in nearly 100 per cent. of the cases when infective males were crossed with infective females, and the figures were almost equally high when the females only were infective, whereas entirely negative results followed the crossing of uninfective females with infective males. This is claimed to be the first case in which the transmission of a virus through the egg has been actually demonstrated.

SETO (F.). **Über das verschiedene Verhalten der Reiskeimlinge bei der 'Bakanae'-Krankheit.** [On the varying reaction of Rice seedlings to the 'bakanae' disease.]—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 20–29, 1933. [Japanese summary.]

In order to express the different kinds of relationship existing between rice seedlings and the causal organism of the 'bakanae' disease (*Gibberella fujikuroi*) [*R.A.M.*, xii, p. 719] in Japan, the writer makes use of Fischer's and Gäumann's conception of aggressiveness and virulence [ibid., ix, p. 19]. Arising out of the difference between the aggressiveness of the fungus and the host's capacity for resistance are three possibilities with respect to the virulence of the former. (1) The resistance of the host may be so far superior to the aggressiveness of the parasite that the latter is unable to penetrate the seedlings, which consequently remain healthy. (2) Aggressiveness on the one hand and resistance on the other may be equally balanced so that the parasite can be described as aggressive but not virulent. An example of this type of relationship is afforded by the recent detection of externally healthy rice seedlings from which *G. fujikuroi* is readily isolated on artificial media [ibid., xi, p. 537]. (3) The aggressiveness of the pathogen is greater than the host's capacity for resistance so that a condition of virulence results, leading to the establishment of the parasitic relation, which may assume one of two diametrically opposed forms, causing either acceleration or retardation of growth. Corresponding to these effects, two groups of virulence may be recognized, namely, 'plus' and 'minus', the former representing the accelerative action of the fungus on the rice seedlings, as commonly observed in nature, and the latter the strongly retarding influence [ibid., xi, p. 536].

Details are given of a series of tests with strains of *G. fujikuroi* isolated from plants showing no symptoms of disease and from those with the plus and minus types of virulence, which indicated that all three groups behaved in the same manner, producing sometimes overgrowth, sometimes dwarfing, and sometimes no symptoms, though one of the strains was predominantly dwarfing. External conditions, such as the temperature of the soil in which the plants were grown, were found to affect the symptoms produced by a given strain of the fungus.

SETO (F.). **Untersuchungen über die 'Bakanae'-Krankheit der Reispflanze. III. Über die Beziehungen zwischen der Bodenfeuchtigkeit und dem Krankheitsbefall durch Bodeninfektion.** [Investigations on the 'bakanae' disease of the Rice plant. III. On the relations between soil moisture and the incidence of disease through soil infection.]—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 125–137, 2 figs., 1933. [Japanese, with German summary.]

Previous observations and experiments by the writer and others have shown that the infection of rice seedlings by the 'bakanae' disease (*Gibberella fujikuroi*) [see preceding and next abstracts] through the soil is in general confined to plants on moist ground, those growing under dry conditions showing the exactly opposite

symptoms of stunting or foot rot. The 'plus' (accelerative) and 'minus' (retarding) activities of the fungus were clearly demonstrated both under experimental and field conditions, and were shown to be produced by the same fungus.

SETO (F.). **Untersuchungen über die 'Bakanae'-Krankheit der Reispflanze. IV. Über die Beziehungen zwischen der Bodentemperatur und dem Krankheitsbefall bei Bodeninfektion.** [Investigations on the 'bakanae' disease of the Rice plant. IV. On the relations between soil temperature and the incidence of disease through soil infection.]—*Forsch. auf. dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 138–153, 1933. [Japanese, with German summary.]

The results of controlled inoculation experiments on rice indicated that a soil temperature of 35° C. is the most suitable both for seedling growth and infection by *Gibberella fujikuroi* [see preceding abstracts]. 'Bakanae' seedlings developed to some extent at a soil temperature of 25° but at 20° the symptoms were generally absent. At 40° the growth of the seedlings was much retarded and the development of diseased ones suppressed. Although the maximum number of diseased seedlings developed in soil at 35°, the actual optimum for the growth of *G. fujikuroi* was found to be 25° [*R.A.M.*, xi, p. 399], at which soil temperature the symptoms were much less apparent. It was ascertained, however, that the fungus is present to the extent of practically 100 per cent. in the tissues of the externally healthy inoculated seedlings kept at a soil temperature of 25°. The effect on the disease would thus appear to be due rather to the action of the soil temperature on the seedlings than on the fungus.

IKEYA (J.). **On a disease of the Rice plant caused by Gibberella saubinetii (Mont.) Sacc.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 292–313, 1 pl., 1 fig., 1933. [Japanese, with English summary.]

Practically no morphological or physiological differences could be detected in the writer's comparative studies between strains of *Gibberella saubinetii* isolated from wheat and rice [*R.A.M.*, iii, p. 422; xi, p. 537], respectively. The optimum temperature for mycelial growth in both strains on apricot or potato decoction and soy-bean agars was found to be about 28° C. Inoculation experiments with the wheat strain gave positive results on rice. *G. saubinetii* caused more damage to rice seedlings on soils kept at 20° and 24° than at 28° and 32° C. Filtrates of culture solutions in which the fungus had grown were toxic to cut stems of watermelon, cucumber, and horse bean [*Vicia faba* var. *minor*].

IKENO (S.). **Studies on Sclerotium diseases of the Rice plant. VII. On the influence of continuous wetting and discontinuous wetting on infection of the Rice plant by Hypochnus sasakii Shirai.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 219–237, 1933. [Japanese, with English summary.]

Rice plants inoculated with *Hypochnus* [*Corticium*] *sasakii*

under conditions of discontinuous wetting contracted heavier infection and required a shorter minimum time of total wetting to effect it than those exposed to continuous wetting [*R.A.M.*, xiii, p. 124]. On exposure of the plants to alternating brief periods of drying and wetting, the incidence of infection increased in proportion to the duration of the former. The course of infection in inoculated plants exposed to direct sunlight out-of-doors during drying is somewhat irregular as compared with greenhouse results. If the sclerotium is inserted between the leaf sheath and culm of the plant near the ligule and a suitable temperature for the growth of the fungus is maintained, the normal atmospheric humidity of the greenhouse suffices to permit infection without any additional water supply. Infection occurs somewhat more readily on the lower than on the upper portion of the culm. The minimum incubation period of *C. sasakii* on rice in these tests was 24 hours and the normal between two and three days.

IKENO (S.). **Studies on Sclerotium diseases of the Rice plant. VIII. On the relation of temperature and period of continuous wetting to the infection of Soy-Bean by the sclerotia of Hypochnus sasakii Shirai and on autolysis of the same fungus.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 238–256, 1 fig., 1 graph, 1933. [Japanese, with English summary.]

The minimal periods of continuous wetting necessary for the infection of soy-bean by *Hypochnus* [*Corticium*] *sasakii* [see preceding abstract] under experimental conditions were found to be about 24 hours at 24° and 18 at 28° and 32° C. With injured leaves the minimal periods are 24 hours at 20° and 24°, 18 at 28°, and 12 at 32°. Negative results were given in these tests by inoculation experiments at 34° and 36°. The optimum temperature for soy-bean infection by *C. sasakii* (28° to 32°) is thus the same as for rice. Autolysis was clearly evident in cultures of *C. sasakii* on Richards's solution.

ABE (T.). **On the influence of soil temperature upon the development of the blast disease of Rice.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 30–54, 1933. [Japanese, with English summary.]

In a series of controlled experiments to determine the influence of soil temperature on the occurrence of rice blast [*Piricularia oryzae*: *R.A.M.*, xii, p. 784], the minimum number of diseased seedlings developed at 28° C. and the maximum at 20°, the lowest temperature tested. Hence the susceptibility of the seedlings to blast is least when they are grown at or near the optimum temperature for their development (28° to 32°), and increases proportionately in cooler soils. The lower the soil temperatures, the more severe was the foot rot of seedlings resulting from inoculation with *P. oryzae*. At low temperatures the host tissues remain longer undifferentiated, on account of a slowing down of the growth processes, and this effect of low temperature on the host may be important in increasing the severity of infection even at temperatures below the optimum for the fungus.

KONISHI (S.). **On physiologic specialization in the Rice blast fungus, Piricularia oryzae Br. et Cav.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 55–57, 1 pl., 1 diag., 4 graphs, 1933. [Japanese, with English summary.]

The writer has found that the rice blast fungus, *Piricularia oryzae* [see preceding and next abstracts], consists of a number of physiologic forms distinguishable by their appearance on potato-saccharose (1 per cent.) agar and extent of mycelial growth at different temperatures [*R.A.M.*, xi, p. 538]. The cultural characters by which the forms may be separated include coloration of the submerged mycelium, formation of aerial hyphae, and amount of sporulation. As regards temperature relations, judged by the diameter of the colonies on potato-saccharose or rice straw decoction agar, the physiologic forms of *P. oryzae* fall into at least three groups, the third and largest of which comprises the strains making good mycelial growth at 32° C. Certain strains are unable to develop at 36° while others develop freely at that temperature. Strain No. 18 (Sasaki's Ehime B) and a similar one, both originating in mountain valleys with high humidity and relatively little sunshine, are more highly specialized than the other physiologic forms both in respect of temperature relations and cultural characters. Saltation was observed in pure culture. The physiologic forms were found to differ in their pathogenicity to rice seedlings. No resemblance to *P. zingiberi* or *P. grisea* [ibid., xii, p. 395] was shown by the forms of *P. oryzae* studied.

SUZUKI (H.). **On the relation of soil moisture to the development of the Rice blast disease, with special reference to the results of inoculation experiments on the resistant and susceptible varieties of the paddy Rice and the upland Rice.** —*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 78–97, 1933. [Japanese, with English summary.]

Continuing Hemmi's investigations on the relation of soil moisture to the incidence of rice blast (*Piricularia oryzae*) [*R.A.M.*, x, p. 536 and preceding abstracts], but using a larger number of varieties including both upland and paddy types, the author confirmed Hemmi's conclusions that the more humid the soil on which the plants grow or the longer it remains damp the greater is their resistance to the disease.

ABE (T.). **On the relationship of atmospheric humidity to the infection of the Rice plant by Piricularia oryzae B. et C.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 98–124, 1933. [Japanese, with English summary.]

In order to determine the connexion between relative atmospheric humidity and the infection of rice by *Piricularia oryzae* [see preceding abstracts], seedlings grown in water cultures were inoculated with a spore suspension of the fungus and kept in desiccators adjusted by various concentrations of sulphuric acid to 90, 92, and 100 per cent. relative humidities for 24 hours at 24° to 25° C., when they were transferred to a greenhouse bench. At the end of a week all the inoculated seedlings kept for 24 hours at 92 and

100 per cent. showed the typical blast symptoms, while those at 90 per cent. were quite healthy.

Slides bearing drops of a spore suspension of *P. oryzae* dried naturally at room temperature were kept for 24 hours at 24° to 25° in Petri dishes at 92 and 96 per cent. relative humidity. Slight germination occurred on the slides kept at 96, but none on those at 92 per cent. Similar results were obtained with *Peronospora spinaciae* [*R.A.M.*, viii, p. 626]. Fairly good germination of *Piricularia oryzae* in direct contact with water in Petri dishes was obtained at 96 per cent. relative air humidity, but none at 92 per cent. Thus the limit of relative humidity for the germination of the rice blast fungus is almost the same when the spores are wet as when they are dry. A few of the rapidly germinating spores of *Peronospora spinaciae* developed when similarly in contact with water at a relative air humidity as low as 89 per cent. From the results of these tests it may reasonably be concluded that no blast infection of rice seedlings occurs at relative humidities below 90 per cent. owing to the incapacity of the spores for germination under such conditions.

SUZUKI (H.). **On the relation of soil moisture to the development of the blast disease of Rice plant, with special reference to the results of inoculation experiments on seedlings and pedicels of spikes of plants grown on soils differing in the time and duration of drying and irrigation.**—*Forsch. auf dem Geb. der Pflanzenkrank.*, [Kyoto], ii, pp. 172–185, 1 diag., 1933. [Japanese, with English summary.]

The susceptibility of rice seedlings to blast [*Piricularia oryzae*: see preceding and next abstracts] was found to be greatest in a plot where the soil was left continuously dry throughout the growing period, followed by that in one left dry for the first half of the season and irrigated during the last. Next in the decreasing order of infection came a plot irrigated during the first half of the growing period and left dry for the second, the lowest figure for infection being given by a plot irrigated throughout the time of vegetation. The influence of drought on the susceptibility of the seedlings is evidently at its height in the juvenile phase. The spike pedicels were shown by inoculation experiments to be susceptible to blast throughout the growing period, especially before flowering. As in the seedling inoculation tests, the maximum amount of infection occurred in the plot left dry during the entire growing period and the minimum in that continuously irrigated. A correlation was detected between the incidence of blast and the thickness of the outer epidermal cell walls, corresponding to the amount of silica contained in them.

ABE (T.). **On the influence of iron sulphate upon the growth and vitality of Piricularia oryzae, with special reference to temperature as an environmental factor.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 186–201, 1933. [Japanese, with English summary.]

At 28° C., the optimum temperature for the growth of a strain

of the rice blast fungus (*Piricularia oryzae*) [see preceding and next abstracts], mycelial development was stimulated by the addition of 1/1,000 mol. iron sulphate to a potato decoction agar medium containing 1 per cent. sucrose, no such effect being noticeable, however, at other temperatures. On a liquid medium the mycelium grew best at 24°, but the liquid cultures differed from the solid in that the presence of 1/1,000 mol. iron sulphate stimulated growth at all temperatures from 16° to 32°. No mycelial growth took place on agar containing 1/50 mol. iron sulphate between 16° and 32°, but development occurred in the presence of 1/100 mol. or less at all temperatures except 32°. The corresponding figures on the liquid medium were 1/200 and 1/400 mol. respectively. At all the temperatures tested, conidial formation was retarded in inverse proportion to the concentration of iron sulphate added to the agar medium, being practically nil at concentrations above 1/200 mol. Chlamydospore production, on the other hand, showed a tendency to increase gradually with the increment of iron sulphate. No aerial mycelium developed on a medium containing over 1/200 mol. iron sulphate at any of the temperatures tested. The hyphae became very nodular in the presence of high concentrations of iron sulphate, which also turned the colour of the colonies from greyish-white to sooty green or greenish-yellow.

SUZUKI (H.). **On the relation of soil moisture to the development of the blast disease of Rice, with special reference to the inoculation experiments on plants grown on soils differing in moisture and amount of nitrogenous manure.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 279–291, 1933. [Japanese, with English summary.]

The results of inoculation experiments with *Piricularia oryzae* [see preceding abstracts] on rice seedlings and the spike pedicels of plants grown on soils varying in moisture content and nitrogenous fertilization showed that the susceptibility of the plants to blast was primarily dependent on the former factor. The seedlings, adult leaves, and spike pedicels grown on flooded soil with a certain amount of nitrogenous manure were more resistant to infection than those on dry soil with half the quantity of the same manure, this reaction being apparently correlated with a more extensive accumulation of silica in the epidermal cell-walls of the leaves of plants developing under the former conditions.

Airplane for Hop dusting.—*Better Fruit*, xxviii, 3, p. 13, 1933.

An aeroplane is being used in the control of hop downy mildew [*Pseudoperonospora humuli*] in the Willamette Valley, Oregon, the machine blowing a copper-lime dust mixture on to the plants and descending as low as 5 to 15 ft. from the ground to do so. The dust is carried in a specially constructed compartment in front of the cockpit and is scattered by the air currents set up by the propeller and two small propeller agitators. *P. humuli* has recently made startling headway in the locality concerned [cf. *R.A.M.*, xii, p. 325].

McRae (W.) & Subramaniam (L. S.). **Effect of mosaic on the tonnage and the juice of Sugar cane in Pusa, Part III.**—*Indian Journ. Agric. Sci.*, iii, 5, pp. 870–880, 1933.

During the season 1932–3 about 4 per cent. less juice was extracted from mosaic-infected than from healthy canes in 16 pairs of experimental plots [*R.A.M.*, xiii, p. 11]. Similar results were obtained in previous seasons' tests. There was slightly less glucose in the mosaic than in the healthy juice, but in other respects the differences between the two lots of plants were not statistically significant.

Ciferri (R.). **Le concept d'espèce dans les microorganismes parasites.** [The concept of species in parasitic micro-organisms.]—*Scientia, August, 1933*, pp. 63–72; *September, 1933*, pp. 83–91, 1933.

After defining the terms 'systematic', 'classification', 'taxonomy', and 'determination' and discussing current views on the reality of species, the author sums up the present situation as regards the limitation and interpretation of taxonomic unity (especially specific unity) in the higher plants with special reference to the confusion resulting from the extension of these concepts to the lower ones, and reviews the characteristics distinguishing taxonomic units in parasitic and saprophytic micro-organisms. He outlines the development of the classification of the bacteria and yeasts, and illustrates the nature of the problem by two queries: (1) should the biological interpretation of taxonomic unity be accepted?, and (2) should taxonomic units based on biological characters rank as species or as something lower, and if so, as what?

To adopt a taxonomy that ignores the biological characters of parasitic organisms and takes cognizance only of their shape is considered to be like trying to distinguish minerals while disregarding their chemical composition. The return to a purely morphological taxonomy appears to be impossible in the light of modern knowledge of biological specificity; taxonomy should be adapted to include all recognizable characters, whatever their nature.

Granted that the biological characters of a micro-organism may be accepted as differentiating taxonomic entities, the question arises what rank or ranks shall be assigned to them?

The best solution, the author thinks, would be to adopt the trinomial nomenclature, in which case the units below specific rank would include those distinguished by all non-macromorphological characteristics. This system would not consider whether a subspecific unit is distinguishable by any particular criterion, but would merely indicate that such a unit is distinct, the description alone giving the reasons. Further, it would maintain a relative homogeneity of species, in the classical sense, one comprehensive unit with ample morphological characteristics being established. If such a nomenclature were adopted a Commission would have to be appointed to determine the morphological species for each Order of fungi and bacteria, and to group around them the secondary units.

STEVENS (F. L.) & PEIRCE (A. S.). **Fungi from Bombay.**—*Indian Journ. Agric. Sci.*, iii, 5, pp. 912–916, 1933.

An annotated list is given of 40 fungi, including eight new species [with English diagnoses], collected by B. N. Uppal in Bombay, of which the following may be mentioned. *Physalospora psidii* n.sp. occurs on guava (*Psidium guajava*) and is characterized by an intercellular, brown mycelium, continuous, elliptical, hyaline microconidia, 5 to 7 by 2 to 3 μ, and similar macroconidia, 12 to 15 by 5 to 8 μ, borne on conidiophores 10 to 13 μ long; scattered, astromatic, immersed subglobose perithecia, with a short protruding, ostiolate beak, 120 to 165 μ in height, 270 to 345 μ in breadth, paraphysate, clavate asci, 72 to 100 by 26 to 33 μ, tapering at the base, and containing 8 elliptical, hyaline ascospores, 30 to 37 by 13 to 16 μ.

Oidium cococarpum n.sp., distinguishable by its scanty, branched, septate mycelium, suberect to erect, short, septate or continuous conidiophores, and hyaline, ellipsoid, concatenate conidia, 8 to 10 by 6 to 8 μ, was observed on coco-nut seed.

Gloeosporium raciborskii occurred on mango and *Myxosporium microsporum* Cooke and Hark. on apple.

VIENNOT-BOURGIN (G.). **Contribution à l'étude des Urédinales de Seine-et-Oise (6me Note). De quelques Urédinales rares ou nouvelles observées dans le département de Seine-et-Oise.** [Contribution to the study of the Uredinales of Seine-et-Oise. (6th note.) On a few rare or new Uredinales observed in the Department of Seine-et-Oise.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 8, pp. 280–289, 1 pl., 1 map, 1933.

This further annotated list of four rusts observed by the author in the Seine-et-Oise Department [*R.A.M.*, xii, p. 537] includes a species of *Gymnosporangium* which was seen in the spring of 1933 on branch swellings of *Juniperus sinensis* in the arboretum of the Agricultural School at Grignon, the teleutospores of which markedly differed from those of the species met with on the junipers commonly cultivated in France. The aecidial stage was found in the summer of that year on *Pyrus sinensis* L. growing at about 50 m. distance from the junipers, and had already been observed in the two preceding years on *P. sinensis*, developing earlier in the season than that usually occurring on pear in the locality. It could not be identified before the discovery of the *Gymnosporangium* on *J. sinensis*, which agrees morphologically with Sydow's description of *G. japonicum*.

A heavy outbreak of *Antirrhinum majus* rust (*Puccinia antirrhini*) occurred during the summer of 1933 at Grignon, especially on the semi-dwarf and dwarf varieties of snapdragons. The rust had already been seen in 1931, but spread to an epidemic extent only in 1933, apparently from two-year-old plants on which it overwintered in the teleutospore stage. Observations indicated that unicoloured varieties (pure red or pure yellow) of *Antirrhinum* are more susceptible than those with variegated flowers. The rust appears to be widespread through the north-west region of France, and has also been reported recently from Great Britain [ibid., xii, p. 764].

OVERHOLTS (L. O.). **The Polyporaceae of Pennsylvania. I. The genus Polyporus.**—*Pennsylvania Agric. Exper. Stat. Bull.* 298, 28 pp., 2 pl., 1933.

In this paper (the subject-matter of which is to be more fully dealt with in a manual covering the Polyporaceae of the United States) the author, after discussing the economic importance of the group and describing the structure of the sporophore and hymenium, gives keys to the 12 genera of Polyporaceae found in Pennsylvania and to the species of *Polyporus* [including *Polystictus*] present in the State. A resumé is then given of the main characters of 90 individual species and varieties.

WEHMEYER (L. E.). **The genus Diaporthe Nitschke and its segregates.**—xi + 349 pp., 18 pl., Ann Arbor, Univ. of Michigan Press, 1933.

In this elaborate monograph the author publishes a revision of some 500 of the 650 nominal species of *Diaporthe* [cf. *R.A.M.*, xii, p. 595]. His material consisted of the published and private exsiccata maintained in the Farlow Herbarium, together with numerous collections loaned from other sources.

Diaporthe is held to be characterized among the neighbouring genera by the presence of black lines in the host, 2-celled ascospores, and *Phomopsis* pycnidia. In this genus, 71 species are accepted on purely morphological grounds, but 'the classification, synonymy and descriptions of species of the genera here considered are in an unsettled and scarcely dependable state'. The consideration of the first 9 of the accepted species involved the investigation of some 380 collections; that of *D. eres* [ibid., xii, p. 126], the investigation of some 417 collections, under 137 specific names, on 68 genera of woody plants.

Revised descriptions of the accepted species are given, having reference to the stromata, their relation to the host plant, the perithecia, asci, and spores, e.g., the characters to which standard diagnoses uniformly refer. A critical survey of the pycnidial stages is not attempted: their 'confusing similarity makes such a study a difficult, separate problem'.

Of the names with a pathological history, *D. sojae* on soy-beans [ibid., ix, pp. 23, 83] is renamed *D. phaseolorum* var. *sojae*, and *D. batatatis* on sweet potato *D. phaseolorum* var. *batatatis* [ibid., xi, p. 535]. On *Citrus*, *D. citrincola* and *D. citri* [ibid., xiii, p. 26] together with *P. citri* and *P. californica* [ibid., xii, p. 213] are considered host forms of *D. medusaea*. *D. perniciosa* [ibid., xii, p. 677; xiii, p. 107] is listed as a synonym of *D. eres*. Among the excluded species, *D. rostellata* on *Rubus* is held to be a *Gnomonia*, and *D. umbrina* on rose [ibid., xii, p. 696] a primitive type of the genus *Cryptosporella*.

The published diagnoses of some 150 species, of which no material was available to the author, are given mainly without comment. The segregate genera are *Cryptodiaporthe* (with 19 species), *Diaporthella* (3 species), *Apioporthe* (8 species), and *Diaporthopsis* (8 species).

Keys are given to the accepted species of each genus, and the host plants are mentioned after such species as are not too pluri-

vorous. There is a full index of fungus names, and upwards of 90 species are illustrated to show the habit of the fungus, together with the ascospores and occasionally the pycnospores.

MATSUMOTO (T.), YAMAMOTO (W.), & HIRANE (S.). **Physiology and parasitism of the fungi generally referred to as Hypochnus sasakii Shirai. II. Temperature and humidity relations.**— *Journ. Soc. Trop. Agric.*, Formosa, v, pp. 332–345, 4 figs., 1 graph, 1933.

Further experiments were carried out under controlled conditions to determine the temperature and humidity relations of the 17 Formosan strains of *Hypochnus* [*Corticium*] *sasakii* previously studied in respect of cultural behaviour and hyphal fusion [*R.A.M.*, xii, p. 331], with the addition of one isolated by M. Mitra at Pusa, India, from 'banded sclerotial disease' of sugar-cane [ibid., xi, p. 432].

In general the grouping of the strains in respect of temperature agrees fairly closely with that based on differential cultural characters and mode of hyphal fusion. The optimum temperature for all the Formosan strains lies between 28° and 31° C., probably near the lower limit, with an estimated minimum and maximum of 13° and 37°, respectively. The temperature requirements of *Rhizoctonia* [*C.*] *solani* strain No. 19 [loc. cit.], the agent of black scurf of potato in Germany, were found to be quite different from those of *C. sasakii*, whereas the Indian strain No. 18 [loc. cit.] of the latter from cotton seedlings approximated closely to the Formosan isolations in this respect. Both in cultural characters and temperature relations the causal organism of 'banded sclerotial disease' of sugar-cane from India was also found to agree closely with the strains collectively known as *C. sasakii* in Formosa. Heavy infection of *Eichhornia crassipes* by strain 1 [from rice] took place at 28°, the minimum and maximum for infection being 16° and 34°, respectively, while the highest incidence of infection occurred at 100 per cent. relative humidity, gradually decreasing in proportion to the decline in the moisture content to about 85 to 88 per cent., below which negative results were obtained.

MATSUMOTO (T.) & HIRANE (S.). **Physiology and parasitism of the fungi generally referred to as Hypochnus sasakii Shirai. III. Histological studies in the infection by the fungus.**— *Journ. Soc. Trop. Agric.*, Formosa, v, pp. 367–373, 3 figs., 1933.

Further inoculation experiments were carried out on camphor (*Cinnamomum camphora*), tobacco, and *Eichhornia crassipes* with a strain of *Hypochnus* [*Corticium*] *sasakii* from rice [see preceding abstract] in order to determine the mode of infection and histological changes induced by the fungus.

The discoloration of the tissues was found to extend some distance beyond the cells actually invaded by the hyphae, especially in the palisade tissue of young camphor leaves, which is composed of thin-walled cells with few intercellular spaces. In *E. crassipes*, the leaf tissues of which are well provided with intercellular spaces, the hyphae are frequently found outside the necrotic area. It

would appear that the tissue discoloration is due to a diffusible product of the fungal metabolism, readily permeable through the cell walls of young parenchyma, especially when the cells are densely packed without intercellular spaces. On leaves kept under dry conditions the spread of the lesions is arrested, and this results in the development of a dark marginal zone with a yellowish halo. The tissues near the halo contain few chloroplasts. The hyphae generally enter the plant through the stomata, though in the early stages of leaf development they may be able to penetrate directly through the cuticle. Cell wall penetration is mainly accomplished by the cellulose-dissolving action of the invading hyphae. The accumulation of starch in the necrotic area points to a disturbance of translocation consequent on infection.

PALM (B. T.). **On parasitic and epiphyllous algae. II. Stomatochroon, a genus of stomaticolous Chroolepideae.**—*Arkiv för Bot.*, xxv A, 16, pp. 1–16, 5 figs., 1933.

Stomatochroon lagerheimii n. g., n. sp., a Chroolepidean alga found occupying the stomata of the upper leaf surfaces of *Chlorodendron* sp. at Medan, Sumatra, is characterized by a cylindrical central thallus cell lying between the guard cells of the stoma, slightly tapering towards the base to which is affixed in the substomatal chamber a bulbous anchor cell with an extensively lobate base. From the free end of the central cell a single sporangiophore ordinarily grows out and bears one apical zoosporangium on a neck cell. Sterile filaments also radiate upwards from the central cell. Thick-walled, smooth, resting sporangia develop around the extramatrical half of the central cell usually to the number of two or three; these may possibly be gametangia, but the zoospores were not further studied. All the aerial parts are of a deep purple colour, the basal cell being vivid green. The haustorium-like shape of the basal cell strongly indicates a physiological rather than a purely mechanical relationship between the alga and its host, but so far no evidence of food transference has been obtained. Other hosts of *Stomatochroon* spp. include wild banana 600 m. above sea level in Sumatra, *Crotalaria usaramoensis* and teak (*Tectona grandis*) also in Sumatra, and *Artocarpus incisa*, avocado, *Anacardium occidentale*, and tomato in Guatemala.

BOSSCHIETER (J. C. A.). **Werkmethoden in verband met Helopeltis en Rodrust.** [Methods of cultivation in connexion with *Helopeltis* and red rust.]—*De Bergcultures*, vii, 46, pp. 1261–1263, 1933.

Much of the damage caused by *Helopeltis* and red rust [*Cephaleuros parasiticus*: *R.A.M.*, x, pp. 345, 760, and above, p. 216] on Java tea estates, in some of which they have become rather prevalent of late, may be prevented by rational methods of shade provision, proper drainage, and a conservative scheme of plucking and pruning to avoid sudden drastic changes in the condition of the bushes. Details are given of successful results in reducing the injury from mosquito blight and red rust by these means in a plantation in West Java.

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GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. I. Some correlation between sporation and cultural characteristics.** —*Trans. Nat. Hist. Soc. Formosa*, xxiii, pp. 37–43, 75–90, 1 diag., 2 graphs, 1933.

A fully tabulated account is given of the writer's continued studies on 33 Formosan and eight foreign strains of *Sclerotium rolfsii* (one from India and seven from the United States) with regard to growth habit, hymenial, sclerotial, and mycelial characters, and rate of development [cf. *R.A.M.*, x, p. 344]. The strains were grown on potato, onion, apricot, and carrot agar for varying periods at 33° and 25° C. and room temperature.

The strains were found to be divisible into four groups in respect of sporulation, viz., I (readily spore-forming) comprising seven isolants, II (spore-forming) with eleven, III (hardly spore-forming) with ten, and IV (non-spore-forming) with thirteen. Group I included strains from potato (U.S.A.) and from six-rowed barley, sugar-cane, cantaloupe, and *Setaria italica*, all on the College Experimental Farm, Taihoku. Among the hosts of the strains comprising group II were pepper [*Capsicum annuum*], beans (*Phaseolus vulgaris*), iris, cantaloupe, peach, and *Cedrus deodara* [*C. libani* var. *deodara*], all from the United States. Group III comprised strains of the fungus from *Garcinia spicata*, clover (*Trifolium repens*), *Allium fistulosum*, and *Petasites japonicus*, all at Taihoku. Group IV was represented by strains from potato (India) and from a species of Cyperaceae, beans, *Lochnera rosea*, *Mentha arvensis* var. *piperascens*, groundnut, *Cymbidium* (?) *longisepalum*, and *Jasminum sambac*, all at Taihoku.

Onion agar was found to be the most favourable of the media used for hymenial production, which was in general most profuse in group I, whereas groups III and IV were characterized by abundant mycelial development. The carrot agar cultures were similar to those on onion, while on apricot mycelial growth was vigorous but hymenial formation very scanty. Potato agar was not a suitable medium for the strains of *S. rolfsii* cultured. In Petri dish cultures the Formosan strains, unlike those from the United States, usually produced little mycelial growth at the centre. On apricot agar sclerotial formation was abundant in groups I and II. In slant cultures a period of at least 30 (up to 100) days was requisite for hymenial formation. The American strains, which failed to produce the hymenial stage in their place

of origin, did so in the writer's experiments. The hymenium is generally pure white at first, sometimes turning yellowish to buff-coloured with age. In certain strains, however, e.g., that from *S. italica*, the colour on carrot agar was cartridge-buff, while various others ranged from pinkish-buff to zinc-orange. Generally speaking, the sclerotia of the spore-forming strains were globose, whereas those of the little or non-sporulating groups were depressed, nodular, or otherwise distorted. They mostly matured about 8 days after subculturing in the case of groups I and II and two days later in the others, but the strains from *C.* (?) *longisepalum* and potato (India) required 14 to 15 days on onion and 13 or more on apricot agar. In colour the sclerotia ranged from red-orange to orange-yellow (Ridgway), those of groups I and II generally tending to develop a darker coloration, especially on potato agar, than the non-sporulating strains.

HORNBY (A. J. W.). **Report of the Assistant Director and Agricultural Chemist.**—*Ann. Rept. Dept. of Agric., Nyasaland, 1932*, pp. 36–47, 2 graphs, 1933.

This report contains the following observations on tobacco diseases in Nyasaland. Angular leaf spot (*Bacterium angulatum*) or a similar disease has caused losses up to 60 per cent. of the crop in certain years, but wildfire (*Bact. tabacum*) has not been observed since 1926, when it developed on plants raised from newly imported, non-disinfected seed.

Mosaic, ring spot, and leaf curl ('cabbaging') have been present on tobacco in Nyasaland for ten years [*R.A.M.*, viii, p. 204; xi, p. 676]. During 1931–2 plants at all stages of growth were found to be susceptible to leaf curl, but little damage resulted from slight late infection in the field. Nursery infection is more serious and may involve heavy losses in the field. Shrubby indigenous plants, such as *Vernonia* sp., seem to be most susceptible to leaf curl in the Southern Province, where they are prevalent on abandoned sites. In the Northern Province *V.* sp. is comparatively rare, but zinnias [ibid., xiii, p. 166] and hollyhocks have been found affected by leaf curl, the whitefly vector of which [*Bemisia gossypiperda*] is abundant. True frenching [ibid., xii, p. 205] is of very rare occurrence in Nyasaland. Ring spot was unusually prevalent in 1931–2, the primary lesions being invaded by a *Phyllosticta* which caused a rotting and crumbling of large leaf areas.

The most serious disease of flue-cured tobacco in Nyasaland is frog-eye (*Cercospora*) [*nicotianae*: ibid., viii, p. 204], which is of minor importance on the dark types. In wet weather the fungus attacks the upper as well as the lower leaves and the spots continue to appear in the barns.

Hollow stalk or pith rot (*Bacterium* [*Bacillus*] *carotovorus* and *B. aroideae*) [ibid., xii, p. 332], which is fairly common in wet seasons, is no doubt largely spread by topping and suckering operations, but the disease has occurred at Zomba on untopped seed plants.

In 1927–8 a serious outbreak of black stem rot was reported associated with *Pythium aphanidermatum* [ibid., viii, pp. 204, 744] but with symptoms of Florida black shank, the presence of

the agent of which (*Phytophthora parasitica nicotianae*) [ibid., xii, p. 793] in Nyasaland has since been confirmed. Infection has been practically eliminated by the abandonment of affected fields and nurseries since the epidemic.

GRATIA (A.). **Pluralité antigénique et identification sérologique des virus de plantes.** [Antigenic plurality and serological identification of plant viruses.]—*Comptes rendus Soc. de Biol.*, cxiv, 35, pp. 923–924, 1933.

Following up Miss Purdy's serological experiments with tobacco mosaic [*R.A.M.*, viii, p. 743], the writer prepared sera against two types of tobacco mosaic, potato mosaic, and potato leaf roll, and also from healthy tobacco. The virulence of the two tobacco mosaics was absolutely neutralized by either of the two tobacco mosaic antigens. None of the other sera produced this effect, their action, like that of normal serum, being confined to a very slight retardation of the symptoms. In a mixture of equal parts of mosaic tobacco juice and anti-mosaic tobacco serum, intense flocculation is rapidly produced, but this phenomenon does not accompany the blending of the tobacco mosaic antigen with that of potato mosaic or vice versa. On the other hand, the potato mosaic antigen flocculates the potato mosaic virus even after transmission to tobacco. Neither the tobacco nor the potato mosaic antigen induces flocculation in the juice of mosaic beetroots. These data are considered to demonstrate the antigenic plurality of plant viruses.

GRATIA (A.). **Qualité antigénique des virus des plantes et des bactériophages.** [The antigenic quality of plant viruses and bacteriophages.]—*Comptes rendus Soc. de Biol.*, cxiv, 35, pp. 925–926, 1933.

In connexion with his serological experiments with tobacco mosaic [see preceding abstract], the writer observed that the juice of mosaic tobacco is not flocculated by the healthy tobacco antigen, and, conversely, the juice of healthy tobacco is flocculated neither by the healthy nor by the mosaic tobacco antigen. Flocculation, therefore, is associated with the mosaic and not with the tobacco 'element', and tobacco mosaic must be conceived as having two antigens, one of very mediocre properties, namely, tobacco, and the other very potent—mosaic. This fact is considered to support the usual view that mosaic is due to an external agent in the shape of a parasitic filterable virus, rather than to an enzyme produced by the plant itself.

It was further observed that certain tobacco plants showed a natural resistance to mosaic infection, and the juice of their leaves, several weeks after inoculation, did not react by flocculation to the addition of anti-mosaic serum, showing that the virus was not present. In diseased plants some leaves (mostly the young ones) show conspicuous symptoms, while others look normal. Mixed with the specific serum, the juice prepared from the former undergoes flocculation in five minutes, whereas that from the latter requires several hours for the same effect to develop, indicating that the virus is present only in small quantity. On the addition of the specific serum to the juice of the pericarp flocculation occurs

in five minutes, while the juice of the interior of the seed does not become flocculated. The process of flocculation, therefore, is an indication of the presence and concentration of the pathogen. Assuming that the active element in flocculation is mosaic, the accompanying passive tobacco element contributes, by its mass and colour, to the visibility of the mosaic precipitate. Mosaic tobacco juice passed through a Berkefeld candle and thus impoverished of the tobacco element gives only a very faint and sometimes invisible precipitate on the admixture of the specific serum; added to healthy tobacco juice, however, it confers on the latter the capacity to respond by flocculation to the anti-mosaic serum. Attention is briefly drawn to the analogies between tobacco mosaic and the bacteriophage phenomenon which the writer is likewise inclined to refer to exogenous agency.

MAY (R. G.). **Prevention of blue mould of Tobacco. Methods adopted with success at Bathurst.**—*Agric. Gaz. New South Wales*, xliv, 10, pp. 745–748, 1 fig., 1933.

This is a brief account of the methods of raising tobacco seedlings in hot air-heated frames, which are stated to have been successfully applied for the last twelve years at the Bathurst Experiment Farm, New South Wales, and to have afforded good control of tobacco blue mould [*Peronospora tabacina*: *R.A.M.*, xiii, p. 214]. Briefly stated, they consist in steaming the soil in the frames just before sowing the tobacco seed, which should be done while the soil is still warm. After sowing, the seed is pressed firmly into the soil with a piece of flat board and covered with fine hessian, which is kept watered with tepid water four or more times a day. The temperature in the frame is kept warm by hot air flue pipes and must not be allowed to drop to 45° or rise above 110° F., care being taken not to open the frames too wide when watering until the seedlings are sufficiently hardened, i.e., until the leaves are about 1½ to 2 inches long. The seedlings are transplanted when they are about 6 inches high.

ARNAUDI (C.). **On the vaccination of the Tobacco plant against Thielaviopsis basicola.**—*Bull. Torrey Bot. Club*, lx, 8, pp. 583–597, 4 figs., 1933.

The writer's experiments [details of which are given] at the Serotherapeutical Institute, Milan, indicated that the resistance of Beckley tobacco to *Thielaviopsis basicola* [*R.A.M.*, xii, p. 493] may be increased by the injection of vaccines prepared from cultures of the fungus by various procedures. The most toxic vaccines are those prepared by trituration of the fungal mat and exposure to the action of ether vapour, which in 48 hours causes the material to become more fluid owing to the plasmolysing action of the ether on the cells. The ether is removed by heating to 37° to 40° C. followed by evaporation *in vacuo*, and the residue diluted with three parts of water. The fact that a similarly prepared *Pythium* vaccine induces no apparent symptoms in inoculated plants proves that the toxicity of the ether-killed *Thielaviopsis* vaccine is not due to adherent traces of ether. From the point of view of inducing immunity, however, a dry vaccine prepared as before but without dilution with water was the most effective, maintaining its efficacy

for two months and acting equally well whether added to the soil in which the germinating seeds were placed or administered to seeds already germinated. The aqueous vaccines were less active when added directly to the soil. Under the conditions of the tests, the immunity acquired by absorption of these vaccines through the roots persists for some two months, a sufficient period to protect the plants during the early stages of development when susceptibility to infection is at its height. In the writer's opinion, the time is now ripe to apply the vaccine treatment against *T. basicola* on a large scale to field tobacco. Very small quantities of vaccine are needed for the treatment of a large number of seedlings, while the technique of preparation is simple and inexpensive [cf. ibid., xiii, p. 117].

MANDELSON (L. F.). **Frog eye leaf spot and barn spot of Tobacco.** —*Queensland Agric. Journ.*, xl, 5, pp. 401–408, 1 pl., 1933.

Tobacco frog eye leaf spot (*Cercospora nicotianae*) [*R.A.M.*, xii, pp. 118, 476, 794] is very prevalent in parts of northern Queensland, where considerable spotting occurs in the field under favourable environmental conditions. The development of further spotting in the curing process ('barn spot') is even more serious [ibid., ix, p. 141], and under the conditions prevailing locally the market value of a crop may be seriously diminished.

As the disease is of major importance only in the tropical areas its optimum development is probably associated with high temperature and humidity. *C. nicotianae* attains its greatest development at about 80° F.; it does not grow at temperatures below about 45° or over about 93°. Spotting is most pronounced when light rains or heavy dews are frequent or when wet weather prevails while the crop is maturing. No varietal resistance has been observed in Queensland.

To secure proper field sanitation against this and some other diseases old tobacco plants must be entirely removed and destroyed not later than one month after harvesting. Any leaves removed from the growing crop must also be carried away from the field and carefully destroyed. The spraying of the seedlings against blue mould [*Peronospora tabacina*: see preceding page] also serves as a protection against frog eye. The most effective control of both frog eye and barn spot, however, is given by early priming, which should be regarded purely as a preventive measure. The leaf should be harvested as soon as mature, over-ripe tissues being highly susceptible.

KOMLÓSSY (G.). **Adatok a Dohánybetegségek elleni védekezési eljárások ismeretéhez. I. Higanytartalmú czávázószerek physiológiai hatásának összehasonlitó vizsgálata a Dohánymagvakra és a mag útján terjedö kórokozókra.** [Contributions to the knowledge of the methods of control of Tobacco diseases. I. Comparative experiments on the physiological effects of mercury-containing disinfectants on Tobacco seed and seed-borne agents of disease.]—*Kisérletügyi Közlemények*, xxxvi, 1–3, pp. 134–163, 2 figs., 9 graphs, 1933. [German summary.]

A comprehensive, fully tabulated account is given of the writer's

experiments at the Budapest Plant Protection Research Institute on the efficacy of five disinfectants in the control of two fungi responsible for heavy damage in tobacco seed-beds, viz., *Alternaria tenuis* and *A. brassicae* Berk. var. *tabaci* Preiss. [*A. tabacina* Gulyás: *R.A.M.*, xi, p. 135]. To test the effect of the fungicides on germination, seeds of *Nicotiana tabacum* var. *latifolia*, *N. latissima* var. *ovata*, and *N. rustica* var. *cordata* were immersed for 10, 30, or 60 minutes in 0·05 to 0·5 per cent. solutions, while fragments from pure cultures of the organisms were subjected to the same treatment for similar periods to determine the relative value of the treatments. On the basis of the resulting data the writer recommends 10 minutes' immersion in 0·1 per cent. higosan [ibid., x, p. 603] or 0·1 to 0·2 per cent. tillantin, 30 minutes in 0·15 to 0·1 per cent. tillantin, and 60 minutes in 0·1 to 0·2 germisan or 0·3 to 0·5 per cent. uspulun, all of which are absolutely fungicidal under the specified conditions. Higor was found to be unsuitable for the object in view.

WANN (F. B.) & BLOOD (H. L.). **Biochemical changes accompanying curly top of Tomato.**—Abs. in *Phytopath.*, xxiii, 11, p. 929, 1933.

The juice of tomato plants suffering from curly top [*R.A.M.*, xii, p. 424] was found to contain considerably more pulp, sugars, and solids than that of healthy ones, while the freezing-point depression was also higher in the former. The titratable acidity of the leaf juice decreased and that of the stem juice increased as a result of the disease, which further caused a reduction of catalase activity in the foliage [cf. ibid., xii, p. 778]. Total sugars increased and total nitrogen decreased in the diseased leaves; in the affected stems there was an increase in total sugars and starch, while the total nitrogen was augmented in some varieties but declined in others.

SHAPOVALOV (M.). **The dieback form of Tomato streak.**—Abs. in *Phytopath.*, xxiii, 11, p. 928, 1933.

A very destructive form of tomato streak [*R.A.M.*, xii, pp. 79, 333], locally known as 'die-back', is reported to be prevalent on the Pacific Coast, where 100 per cent. infection has been observed in some fields. The affected plants, which are usually worthless, show a die-back of the new shoots for several inches, often accompanied by 'bronzing' of the leaves, but no mosaic mottling. These symptoms are similar to those induced by spotted wilt [ibid., xiii, p. 190]. The transmission of this type of streak, in contradistinction to the ordinary 'combination' known by that name [cf. ibid., xiii, p. 193], could not be readily effected by swabbing the juice from diseased on to healthy plants, while biological differentiation tests showed that neither the green tobacco nor the latent potato virus is a component of the die-back virus.

BRYAN (MARY K.). **Bacterial speck of Tomatoes.**—*Phytopath.*, xxiii, 11, pp. 897–904, 3 figs., 1933.

Tomato fruits in Florida, Wisconsin, and Maryland have been found to show a 'peppering' of minute, black, slightly raised, rela-

tively superficial spots, formerly believed to represent a phase of bacterial spot (*Bacterium vesicatorium*) [*R.A.M.*, xii, p. 555] but shown by the writer's investigations to be caused by a hitherto undescribed organism, which is named *Bact. punctulans* n. sp. The lesions on the leaves are round, dark brown to black, extending from the upper to the under surface, but seldom exceeding 1 mm. (the size of the fruit specks) in diameter; adjacent spots may coalesce into large, irregular blotches, the surrounding tissues turning yellow. Artificial inoculations were successful on the stems, petioles, peduncles, pedicels, sepals, and fruits. Infection occurs through the hairs, when these have been injured from any cause, and was also obtained on the cotyledons and young stems of seedlings grown in contaminated soil.

On P_H 7 beef agar slants *Bact. punctulans* occurs mostly as single rods or pairs, sometimes as chains or filaments, the individual cells being 1·3 to 2·5 by 0·6 μ in diameter, motile by up to 7 polar flagella, capsulate, Gram-negative, and non-acid-fast. Green to bluish-green fluorescence is a conspicuous feature of the colonies on beef infusion agar or broth and in Uschinsky's and Fermi's solutions. The organism liquefies gelatine, turns litmus milk blue and coagulates it, reduces nitrates, and utilizes sucrose, dextrose, maltose, lactose, glycerine, and mannite with acid formation (except in the case of maltose and lactose) but no gas, and produces ammonia. The optimum hydrogen-ion concentration for the growth of *Bact. punctulans* was found to range from P_H 6·6 to 7·4, fluorescence being most marked at 7·4 to 7·6. The optimum temperature for the development of the organism lies between 23° and 25° C., with a minimum at 6° and thermal death point at 51°. The bacterium proved highly sensitive to desiccation, most of the strains succumbing to 48 hours' drying.

NOJIMA (T.). **Studies on Polyporus mikadoi Lloyd and Polyporus patouillardii Rick. causing the heartrot of deciduous trees.** —*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 154–171, 2 pl., 2 figs., 2 graphs, 1933. [Japanese, with English summary.]

An account is given of the writer's morphological, pathological, and physiological studies on two fungi causing heart rot of certain deciduous trees near Kyoto, Japan, viz., *Polyporus mikadoi* [*R.A.M.*, xi, p. 813] and *P. patouillardii*. The sporophores of the former species occur in large numbers on the sides of the trunks of weakened or dying cherry trees, while those of the latter are more commonly found on the butts of living *Pasania cuspidata* and oaks (*Quercus gilva* and *Q. glauca*). In the heartwood of *Q. gilva Polyporus patouillardii* produces large, irregular, white areas and small white pockets. Both species may be regarded as belonging to the 'white' lignin-dissolving group of wood-rotting fungi [ibid., xii, p. 740]. The hyphae of both species were found to be capable not only of traversing the pits on the cell walls but also of boring directly through the walls.

Pure cultures of *P. mikadoi* and *P. patouillardii* were readily obtained on apricot, soy-bean, and potato decoction agars. *P. mikadoi* made good growth between 24° and 36° C. with an optimum

just above 30°, the corresponding range for *P. patouillardii* being 24° to 32° (28°). Using Bavendamm's technique [ibid., viii, p. 281], the writer tested the nutritive value of tannic acid in concentrations ranging from 0·05 to 0·5 per cent. in potato decoction agar cultures of both species, the growth of which was found to be promoted between concentrations of 0·05 and 0·1 per cent. The results of these tests are considered to strengthen the evidence regarding the lignin-dissolving properties of the fungi.

Beech disease in Maine forests follows in wake of scale insect.—*Journ. of Forestry*, xxxi, 7, pp. 347–348, 1933.

It is stated that the *Nectria* [*coccinea*] canker has destroyed about one-third of the beech trees of Nova Scotia and many of those in southern New Brunswick. R. K. Beattie found 13 infestations of the European beech scale [*Cryptococcus fagi*], the precursor of the canker, in five towns near Liberty in south-central Maine, the oldest and largest of which, covering 50 acres, is accompanied by canker. The insect and disease have also been found in south-eastern Maine and the insect alone in Massachusetts [*R.A.M.*, xii, p. 405]. The scale forms a white, cottony fluff on the bark and may be followed by the small, red fructifications of the fungus, which is believed to have been introduced from Europe. An intensive study of the disease and insect is to be undertaken immediately by American forest pathologists and entomologists.

LAUBERT (R.). **Mehltau und Rhytisma auf Acer negundo.** [Mildew and *Rhytisma* on *Acer negundo*.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 11, p. 94, 1933.

Attention is drawn to the occurrence on *Acer negundo* of two parasitic fungi seldom found on this widely cultivated tree in Germany, namely a mildew (? *Uncinula aceris*) [*R.A.M.*, x, p. 274], also observed on *A. californicum* at the Berlin-Dahlem Botanical Garden; and *Rhytisma acerinum* [see next abstract], commonly reported on *A. platanoides*, *A. pseudoplatanus*, and *A. campestre* but apparently not hitherto recorded in Germany on the present host.

MAXWELL (H.). **The Sycamore fungus.**—*Nature*, cxxxii, 3341, p. 752, 1933.

Since the writer's previous note on the apparent absence of *Rhytisma acerinum* from sycamores at an altitude of 1,200 to 1,400 ft. at Corrour, Inverness-shire [*R.A.M.*, xiii, p. 135] a few leaves have developed the spots of the fungus, the mode of dispersal of which still remains unknown.

PEACE (T. R.) & HOLMES (C. H.). **Meria laricis the leaf cast disease of Larch.**—*Oxford Forestry Mem.* 15, 28 pp., 5 pl., 1933.

The authors state that the most important disease affecting European larch (*Larix decidua*) in English nurseries is probably leaf cast (*Meria laricis*) [*R.A.M.*, i, p. 404; xii, p. 342] the systematic position of which is stated to be obscure. On the leaf the details of spore formation agree almost exactly with those given

in Vuillemin's description. The hyphae are very fine, thick-walled, intercellular and without haustoria. It was calculated that one infected needle bore at a time from 10,000 to 360,000 spores. In culture each sterigma produces a fresh spore as one is shed. The spores in young cultures average about 9·3 by 3·1 μ (broadest diameter) and are slightly constricted at the centre, where a septum is subsequently laid down. In old cultures the average length of the spores may be 12·4 μ.

Two strains were commonly encountered, one more rapidly growing and more profusely sporing than the other. The number of cells and sterigmata on each conidiophore varied, but in hanging drop cultures at laboratory temperature each sterigma produced an average of one spore per day. Germination took place fairly readily in water, from one or exceptionally both ends of the spore. Without a nutrient little mycelial growth was made, the spores persisting in a state of partial germination or forming other spores on the end of short hyphae. Germinating spores sometimes produced microconidia arising either from a small protuberance or a definite septate conidiophore exactly like the macroconidiophore except for its small size and thin wall. All gradations appeared to exist between the typical macroconidium and the cylindrical microconidium averaging 3·6 by 1·4 μ, but the latter failed to germinate.

The optimum range for growth in culture was 15° to 20°; at temperatures over 25° growth dropped rapidly to zero. At 5° growth was slow but even at −12° the fungus suffered no damage, and resumed growth immediately on removal to warmer conditions. Kept moist the spores from cultures remained viable for long periods (at least 14 weeks), but they survived drying for only a very short time (one hour to two days).

Inoculation experiments [which are fully described] readily gave positive results on *L. decidua*, evidence being obtained that the resistance of the Japanese larch (*L. kaempferi*) is largely due to physiological factors. Seed origin appears to have little effect on the disease. The fungus overwinters on the old needles and on those lying on the ground. It is probably introduced into new nurseries with infected transplants, as natural dissemination appears to be limited in extent.

The disease, from the point of view of control, may be considered to be confined to the nursery. In general, attacks are worst on 2-year beds, the severity of those on 1-year beds depending largely on the date of the first infection and the weather during summer. Damage is likely to be severe only when the primary infection is early and the summer wet. Infection, which was general between 10° and 25°, slight at 5° and 0°, and apparently impossible at 30°, is not dependent on frost injury, and the symptoms differ from those of the latter in that the fungus browns the middle or end of the needle and then spreads down it, whereas frost kills the whole needle at once. *M. laricis* seldom attacks the needles at the extreme tip of the shoot, which is the part most liable to frost injury. Needles attacked by the fungus remain less shrivelled than those killed by frost and usually fall, whereas those damaged by frost generally remain on the plant throughout the season.

Effective control was obtained in nursery beds by a single application of 3 to 5 per cent. amberene [ibid., ix, p. 537], 2 to 3 per cent. sulsol [ibid., xiii, p. 98], or liver of sulphur 14 lb. per 100 galls. water, used at the rate of 5 or 6 galls. per 100 sq. yds., towards the end of February or the beginning of March, followed by further applications every two or three weeks from the end of March until the beginning of August of 1·5 per cent. amberene, 1 per cent. sulsol, liver of sulphur 7 lb. per 100 galls. water, or precipitated sulphur 10 lb. per 100 galls. water. The last-named is less satisfactory than the other sprays and should be used with a caseinate spreader (2 lb. per 100 galls.) or soft soap. Applications should be at the rate of 4 galls. per 100 sq. yds. During dry periods spraying should be discontinued, and the winter strength sprays must not be used after the needles begin to elongate. Satisfactory control is not possible if spraying is delayed until the disease has appeared.

The cost of spraying 1,000 sq. yds. (omitting the labour cost, which can be estimated on the assumption that one man sprays this area in 2 hours) was, using 6 galls. per 100 sq. yds.: amberene 3 per cent. and 5 per cent., 10*s.* 6*d.* and 17*s.*, respectively, sulsol 2 per cent. and 3 per cent., 17*s.* 6*d.* and 26*s.* 6*d.*, respectively, and liver of sulphur 14 lb. per 100 galls. 12*s.* 6*d.*

[A short, popular summary of this paper is given in *Forestry Comm. Leaflet* 21, 6 pp., 3 figs., 1933.]

FILLER (E. C.). **Blister rust damage to Northern White Pine at Waterford, Vt.**—*Journ. Agric. Res.*, xlvii, 5, pp. 297–313, 2 figs., 2 diags., 1 graph, 1 map, 1933.

The investigation reported in this paper was carried out from 1924 to 1930 on a total of 2,226 northern white pines (*Pinus strobus*) on an area of 27·43 acres at Waterford, Vermont, 416 of which were 60 years old and stood in a mixed stand of this species with spruces and hardwood trees. The trees were grouped according to their height and to the number of years they had been exposed to infection with blister rust (*Cronartium ribicola*) [*R.A.M.*, xii, p. 799] from neighbouring black currant bushes, which had been destroyed in 1917, and from wild *Ribes* species which were eradicated in 1925. In that year the incidence of the rust was found to range in the different classes of the white pines from 0 to 62 per cent., the proportion of the infected trees increasing with their height and with the number of years of exposure to infection. In 1930, 76 per cent. of the 416 60-year-old trees were found to be infected (including 24 per cent. of the total which had already been killed), and 65 per cent. of them were considered to be doomed owing to the presence on them of trunk cankers which have been proved to be almost invariably fatal. The percentage of the diseased trees killed by the rust increased from 11 in 1925 to 31 in 1930, representing an average yearly increase of 4 per cent. deaths. The proportion of infected trees in this stand was greater in the unsuppressed than in the suppressed group, presumably because of the larger crowns in the former group, but pines of the latter were being killed more quickly owing, at least in part, to their smaller size. With the exception of the largest-sized group, some trees had already been killed in all the other classes.

The proportion of the basal area (i.e., the area of a cross section of the trunk at stump height inside the bark) of the white pines represented by dying or dead trees increased from 8 per cent. in 1925 to 23 per cent. in 1930, an average yearly increase of 3 per cent., and it is believed that the killing of the trees will eventually reduce the basal area of this species in the area by between 64 and 79 per cent. The same also applies to the proportion of the total board-foot volume of the white pines represented by the trees beginning to die or already killed by the disease. It is thought that if the further spread of infection had not been checked in 1925 by the eradication of all species of *Ribes* in the vicinity, the ultimate loss of white pines would have approached 100 per cent. The actual economic loss in the merchantable stand, represented by the 416 60-year-old trees, from blister rust, calculated at a normal stumpage value of $8 per 1,000 ft., amounted to $19·86 per acre, and as additional pines die or deteriorate, the loss will increase to a maximum between $112·16 to 139·18 per acre, depending on the length of time before the stand is felled.

LACHMUND (H. G.). **Resistance of the current season's shoots of Pinus monticola to infection by Cronartium ribicola.**—*Phytopath.*, xxiii, 11, pp. 917–922, 1 diag., 1933.

Since the environmental and other obvious conditions predisposing to infection by blister rust (*Cronartium ribicola*) are at least as favourable on the needles produced on the current season's growth of *Pinus monticola* as on older ones, and probably more so, the paucity of cankers due to sporidial infection in any one year on the growth of that year compared with the numbers on the older internodes is attributed to the possession by the needles borne on the former of a purely temporary resistance, declining rapidly during the first season and scarcely extending into the second [*R.A.M.*, xii, p. 603].

PRETI (G.). **Moria delle piantine di 'Pinus australia' per 'fusariosi'.** [Seedling blight of '*Pinus australia*' due to 'fusariosis'.]—*Riv. Pat. Veg.*, xxiii, 9–10, pp. 363–369, 3 figs., 1933.

This is a brief account of a severe outbreak of a blight of germinating seedlings of *Pinus 'australia'* which was observed in the spring of 1933 in a large nursery in Savona, Italy, and found to be caused by *Fusarium roseum* [*Gibberella saubinetii*]. The paper terminates with recommendations for the control of the trouble, chief among which is the disinfection of the soil in the seed-beds. The seed should be steeped for 10 hours in a 0·05 per cent. copper sulphate solution and washed afterwards in milk of lime to neutralize the deleterious effect of the copper sulphate on germination.

HINTIKKA (T. J.). **Muutamia havaintoja Männyn tuudenpesistä.** [Contributions to the knowledge of witches' brooms of Pine.] —Reprinted from *Acta Forest. Fennica*, xxxix, 15 pp., 7 figs., 1933. [German summary.]

Seeds from 20 cones from a witches' broom on pine in Karelia,

Finland, were sown in May, 1931 and the resulting seedlings planted out in the autumn of 1914. In 1919, when the 84 plants had to be transferred to another site, 41 were found to be normal and 43 of the witches' broom type. In 1923 the average length of the 1922 shoots on the normal plants was 16·7 cm. compared with 6·8 cm. for those on the witches' brooms. It is evident that the tendency to witches' broom formation in pines is hereditary [*R.A.M.*, xiii, p. 202]. In agreement with M. Hertz (*Luonnon Ystävä*, xxvi, p. 147, 1923) and Liernur [*R.A.M.*, vi, p. 706], the writer regards the manifestation as a form of nanism. Of the above-mentioned witches' broom plants only nine are now surviving, their height varying from 85 to 180 cm., while that of the normal individuals is 4 to 5 m.

FINDLAY (W. P. K.). **Recent research on timber.**—*Science Progress*, xxviii, 109, pp. 61–68, 1933.

A semi-popular account is given of the researches on various aspects of timber protection in progress at the Forest Products Research Laboratory, Princes Risborough. In connexion with the observations on dry rot (*Merulius lacrymans*), it is mentioned that a recent outbreak of the fungus on a large housing estate near London caused damage to the value of £39,000 (*The Times*, 5th April, 1933) [cf. *R.A.M.*, xii, pp. 68, 669].

KAMESAM (S.). **Testing and selection of commercial wood preservatives.**—*Forest Res. Inst., Dehra Dun, Forest Bull.* 81 (Econ. Ser.), 40 pp., 2 diags., 1933.

A fully detailed and tabulated account is given of the writer's laboratory experiments at the Dehra Dun Forest Research Institute, India, on the relative efficacy of a number of wood preservatives against *Coniophora cerebella* [*C. puteana*], *Lenzites thermophila*, and *Fomes annosus* on pine (*Pinus sylvestris*) and beech. As in previous tests, falkamesam (equal parts of sodium arsenate and potassium dichromate) gave eminently satisfactory results [*R.A.M.*, xi, p. 685], showing a better fixation of arsenic in the wood than any of the other substances tried. It was also effective against beetles.

CHAPMAN (A. D.). **Effect of steam sterilization on susceptibility of wood to blue-staining and wood-destroying fungi.**—*Journ. Agric. Res.*, xlvii, 6, pp. 369–374, 1 fig., 1933.

In the experiments briefly reported in this paper, two species (*Ceratostomella pilifera* and *Graphium rigidum*) of the blue-staining fungi and two (*Poria incrassata* and *Lentinus lepideus*) of the wood-rotting fungi developed better, under strictly comparable conditions, on three species of coniferous wood that had been autoclaved for 5 minutes at 12 lb. pressure or for 30 minutes at atmospheric pressure, than on untreated wood, as judged from the fact that the former fungi caused a greater reduction in the strength, and the latter led to more loss in weight, of the steamed wood than of the control material. These results would indicate that considerable caution is necessary in interpreting the results of experiments to test the action of wood-deteriorating fungi, in

which the wood is subjected to heating or sterilization by steam, as apparently this process renders the wood a more congenial substratum for at least some of the organisms than the natural product.

VERPLANCKE (G.). **Hôtes nouveaux des maladies à virus filtrants de la Betterave.** [New hosts of the Beetroot diseases due to filterable viruses.]—*Bull. Soc. Roy. Bot. de Belg.*, Sér. 2, xv, 2, pp. 137–147, 1933.

A tabulated account is given of the writer's cross-inoculation experiments at Ghent, Belgium, with the yellows and mosaic viruses of beet on 60 plants (mostly common weeds), the results of which have already been summarized from another source [*R.A.M.*, xiii, p. 211].

SEVERIN (H. H. P.) & FREITAG (J. H.). **Some properties of the curly-top virus.**—*Hilgardia*, viii, 1, pp. 1–48, 3 figs., 1933.

The results of further experiments [full details of which are given] on the transmission of curly top of beet by the leafhopper *Eutettix tenella* [*R.A.M.*, xi, p. 419; cf. xiii, p. 4], showed that the nymphs of the insect failed to transmit the disease if fed on juices extracted in free air from the leaves of experimentally infected seedlings in the greenhouse, whereas infections were obtained when they were fed on juices extracted under anaerobic conditions [by a method which is described]. Apparently the failures in the first series were due to oxidation of the virus. Comparative tests showed that nymphs fed on centrifuged juices from diseased beet roots transmitted the disease more readily than those fed on similarly treated juice from the leaves.

The longevity of the virus in the filtrate from diseased root juice, prepared under aerobic conditions, was 7 days, while the filtrate prepared under partly anaerobic conditions from supercentrifuged juice gave infections at the end of five weeks. In the filtrate adjusted to P_H 5 and 6, and kept protected against access of air, the virus was still active after 100 days, when the experiment was concluded, but in the similar filtrate adjusted to P_H 3·5, it was apparently inactivated in a week. Attempts to cultivate the virus in a nutrient solution (300 c.c. sterile beet root juice, 50 c.c. 2 per cent. beet sugar, and 50 c.c. 2 per cent soluble starch solution) under anaerobic conditions were unsuccessful.

It was further found that the curly top virus lost its activity in the pulp of diseased beet roots slowly dried in the greenhouse for five weeks. Inoculum prepared from dried infective leafhoppers was found not to contain active virus. The virus retained its infectivity when the juice from diseased beet roots was diluted with centrifuged juice extracted from Alameda or Mammoth sweet maize (both immune from curly top) at rates from 4 in 1 to 1 in 2, but in dilutions at the rate of 1 in 50, 1 in 100, and 1 in 200, it was inactivated in 2, 4, and 6 hours, respectively.

Supercentrifuging the diseased beet root juice three times did not result in apparent sedimentation of the virus, and no increase in the number of infections was obtained with the supercentrifuged liquid prepared by resuspending the gummy residue in distilled

water; when a mixture of this liquid and aluminium gel was added to diseased root juice filtrate, no infections were obtained after the first day. The tolerance to dilution of centrifuged diseased root juice and of the virus extract from infective leafhoppers was found to be 1 in 1,000 and 1 in 24,000, respectively. The thermal death point of the virus was 80° C. in 10 minutes' exposure. Filtered diseased beet root juice retained its infectivity for over eleven months when kept at — 18° C.

VAN HALTERN (F.). **Spraying Cantaloupes for the control of downy mildew and other diseases.**—*Georgia Exper. Stat. Bull.* 175, 53 pp., 6 figs., 1933. [Abs. in *Exper. Stat. Record*, lxix, 5, pp. 668–669, 1933.]

The stems, leaves, tendrils, and blossom peduncles of cantaloupes in Georgia are subject to infection by downy mildew (*Pseudoperonospora cubensis*), the incubation period of which ranges from 4 to 13 days according to the temperature. In air saturated with moisture sporulation occurred between 45° and 86° F., but it did not occur if there were free water on the leaf. Germination of the conidia took place at a temperature range from 34° to 80·6°, with an optimum between 66° and 70°. Dry, hot sunlight or temperatures much exceeding 86° destroyed the conidia even in water.

The theory is advanced that Florida serves as a perpetual source of infection by this downy mildew for Georgia and more northerly States, where the loss from the disease is negligible in seasons when the spring is cool and dry in Florida, retarding the development and spread of the fungus.

The best control of *P. cubensis* was by weekly applications during vegetation of Bordeaux mixture composed of 1 lb. snowform copper sulphate and 2 lb. hydrated lime per 50 galls. water [cf. *R.A.M.*, xii, p. 493].

Brief notes are given on powdery mildew [*Erysiphe cichoracearum*], anthracnose [*Colletotrichum lagenarium*], and *Macrosporium* leaf blight [*Alternaria cucumerina*: ibid., xi, pp. 152, 557, 620] of cantaloupes.

WARE (W. M.). **A disease of cultivated Mushrooms caused by Verticillium malthousei sp. nov.**—*Ann. of Botany*, xlvii, 188, pp. 763–785, 2 pl., 6 figs., 1933.

A detailed account is given of the author's investigation of a disease of cultivated mushrooms (*Psalliota arvensis* and *P. campestris*) observed in 1922 in Kent. Its most conspicuous symptoms were the frequent deformity of the diseased mushrooms, which had shapeless or reduced caps, the edges of which were seldom capable of separating from the stipe, and the abnormally white colour, due to the presence of the white or greyish-white mycelium of a species of *Verticillium*. On mushrooms which were not deformed greyish-white patches of the mycelium were seen on the pileus, stipe, and gills. The disease differs from that caused by *Mycogone perniciosa* [*R.A.M.*, xii, p. 72] in the absence of exudations of brown liquid,

the less vigorous and flocculent growth of the superficial mycelium, and the considerably slower decomposition of the infected mushrooms which are firm and of a somewhat leathery consistency. The pathogenicity of the fungus was established under controlled conditions both to mushrooms grown in beds and to cut mushrooms in the laboratory. In agar cultures it did not survive an exposure for six hours to a temperature of 40° C., this being considered to indicate that the casing soil of the beds is more likely to be the source of infection than the manure.

Morphologically the fungus is characterized by creeping, septate, hyaline, branched hyphae, 1 to 3 μ in diameter (4 to 5 μ at points of branching). The conidiophores are lateral or terminal, erect, septate, sometimes simple and 10 to 200 by 1·5 to 2 μ but generally verticillately branched and up to 910 by 1·5 to 5 μ. The secondary branches are usually septate at the base, rarely with an additional septum in the middle, arising in whorls, and 20 to 40 by 2 to 3 μ, tapering to 1 μ at the tip. The whorls are one to ten in number on the main axis, and are composed of 2 to 12 branches which are usually simple, rarely with secondary whorls. The conidia are oblong or cylindrical, occasionally irregularly fusoid, with obtuse ends, continuous, and 3 to 16 by 1·5 to 5 μ (average 6·6 by 2·5 μ). They are abstricted singly at the tip of the branch, but remain clustered with mucilage in globular masses, 4 to 14 μ in diameter, which swell and dissociate in water. The species agrees closely with G. T. Malthouse's incomplete description in 1901 of a *Verticillium* causing a disease of mushrooms in Edinburgh (*Trans. Edinburgh Field Naturalists' and Microscopical Soc.*, iv, 3, 1901), and the name *V. malthousei* is proposed for it. A Latin diagnosis is appended.

Infection experiments showed that deformation of the mushrooms only results when they are infected in the earliest stages of their growth, while infection at later stages causes local lesions, such as the typical spotting of the pilei and stipes.

Among the recommendations for control are the suppression of insects in the mushroom houses since there was evidence that insects could help in disseminating the conidia, the reduction of air temperature to between 50° and 55° F., removal of all diseased specimens, and watering of the beds only after the removal of the diseased mushrooms. Steam sterilization of the casing soil may be tried as a preventive measure.

IMAI (S.). **On the taxonomy of nameko fungus in Japan.**—*Bot. Mag.*, Tokyo, xlvii, 557, pp. 384–389, 1933. [Japanese, with English summary.]

'Nameko' is the common local Japanese name for a group of at least six highly appreciated edible fungi, including *Collybia velutipes* [*R.A.M.*, xii, p. 44], *Pholiota adiposa, P. mutabilis, Flammula lubrica,* and *F. lenta,* all of which have gelatinous pilei. In 1929 T. Ito described *C. nameko,* a comparison of which with a species of *Pholiota* popularly known as 'nameko' showed that the two are identical. The name *C. nameko* is therefore changed to *P. nameko* (T. Ito) S. Ito et Imai, with a Latin diagnosis.

GARBOWSKI (L.) & JURASZKÓWNA (Mme H.). **Choroby roślin użytkowych w okresie 1926-1930. Zestawienie notowań Zakładów Ochrony Roślin.** [Diseases of useful plants in the period 1926 to 1930. A summary of the reports of the Plant Protection Stations.]—*Rocznik Ochrony Roślin* [*Plant Protection Yearbook*], Bydgoszcz, Sect. A, i, pp. 97–235, 1933.

This is a very briefly annotated list [arranged by the hosts] of the more important bacterial, fungal, and virus diseases, and physiological troubles of cultivated or wild plants and trees of economic or ornamental value, which were reported by the various Plant Protection Stations of Poland in the period from 1926 to 1930, inclusive, and among which the following may be mentioned. Yellow leaf spot (*Cercospora concors*) [*R.A.M.*, x, p. 76] was very widespread on potatoes in the province of Poznań in 1929 and 1930. In 1929 sugar beets in one locality were heavily attacked by scab (*Actinomyces* sp.); in the other years minor outbreaks of *Bacillus tubificans* [ibid., vi, p. 147] and of *Bacterium scabiegenum* [ibid., x, p. 293] occurred locally on this host. Other records include smut (*Urocystis cepulae*) [ibid., xii, p. 610] and bacteriosis (*Bacillus cepivorus*) [ibid., vi, p. 466] of onion; bacterial crown rot (*Bacterium rhaponticum*) [ibid., iii, p. 629] of rhubarb; *Alternaria brassicae* var. *somniferum* Br. et Cav. on opium poppy; *Oospora lactis parasitica* [ibid., viii, p. 140], *Macrosporium* [*Alternaria*] *tomato* [ibid., xii, p. 662], and *Phytobacter lycopersicum* [ibid., x, p. 494] on tomato; *Pythium aphanidermatum* on cucumber; *Pseudomonas* [*Bacterium*] *juglandis* [ibid., xii, p. 338] on walnuts; *Rhabdospora ramealis* var. *macrospora* [cf. ibid., viii, p. 288], *Coniothyrium fuckelii* var. *rubi*, *Coryneum ruborum* [ibid., vi, p. 738], *C. rubi*, and *C. microstictum* [ibid., vii, p. 700] on raspberry; and *Pseudomonas syringae* [ibid., xii, p. 26] on the lilac. The paper terminates with a full index of the Latin names of the organisms mentioned.

Administration Report of the Director of Agriculture, Trinidad and Tobago for the year 1932.—58 pp., 1933. [Received February, 1934.]

In 1932 witches' broom (*Marasmius perniciosus*) of cacao in Trinidad [*R.A.M.*, xii, p. 143] was reported on 3,800 properties, totalling 130,000 acres out of the 200,000 under cacao in the island, as against 2,454 the previous year. Prolonged wetting followed by high atmospheric humidity and protection from light and heat most favoured the formation of sporophores. Sporophores appear to be very rarely produced on leaves, only two appearing on 13,290 leaves tested after exposure to conditions favourable to natural infection. In inoculation tests no infection of dormant buds was obtained under conditions that gave 54 per cent. infection of active ones [ibid., x, p. 658]. The incubation period in the latter (to first appearance of symptoms) was 21 to 52 days. Even when dormant buds were taken from trees with about 400 brooms or infected cushions on each and were budded on to healthy stocks in a disease-free area the 15 that succeeded gave only healthy shoots.

The two chief rainy periods normally set in in June and November and it is recommended that special efforts should be

made to remove all brooms and excise the diseased tissues twice annually, in May and October, in order to check sporophore production. Spore trapping experiments showed that aerial dissemination was occurring in heavily infected areas in June, before the onset of the rains. As the incubation period varies from 3 to 8 weeks, the maximum number of new brooms appears in the dry season following the rains (at Marper experimental estate 50 per cent. occurred during the main flushing season in February and March and 20 per cent. during the Indian summer flush in late autumn), but it is concluded that new infections can also take place during the dry seasons, when there are heavy showers from time to time.

While the loss in yield for Trinidad as a whole is not yet very appreciable, one grower reported that about 25 per cent. of his mature pods were attacked.

Spraying and dusting experiments with agrisol, amberene, Cooper's fungicide, Bordeaux mixture, vermorite, Cooper's bordinette, kolodust, kolokil, olite sulphur, and cupryl powder gave no very pronounced degree of control, while different fertilizers did not appear to affect the incidence of infection.

On the experimental Marper estate all diseased tissues were cut out and burnt every month. The total number of diseased tissues found was 213,023, or 2,287 per acre, a decrease of 15 per cent. on 1931 [ibid., xii, p. 143]. The total cost for the year, including supervision, was $7·45 per acre [= approximately £1 10*s.* at par.].

A critical study was begun of the conditions under which bronze leaf wilt of coco-nuts [ibid., xii, p. 143] occurs on certain selected estates, and the evidence so far obtained suggests that in some cases the disease may be due to destruction of the roots in waterlogged soil during the rainy season, with the consequent upsetting of the balance between root absorption and leaf transpiration during the dry season.

Among miscellaneous records the following may be cited, Tonca [or Tonquin] beans (*Dipteryx odorata*), now widely planted in Trinidad, were found in two localities attacked by a thread blight due to a *Corticium*. Withertip and blossom blight of limes (*Gloeosporium limetticolum*) [loc. cit.] was very prevalent, the crop on some estates being only one-quarter of the normal amount. Considerable damage was caused by a stem rot of rice apparently due to *Sclerotium oryzae* [see below, p. 322].

HANSFORD (C. G.). **Annual Report of the Mycologist, 1932.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31st December, 1932* (Part II), pp. 55–56, 1933.

In this report [cf. *R.A.M.*, xii, p. 421] it is stated that some of the new strains of cotton grown in breeding plots in Uganda show signs of being highly resistant to blackarm (*Bacterium malvacearum*), several strains now growing at Serere being much more resistant than S.G. 29, the variety extensively grown in the Eastern Province.

In an Appendix a full account is given of experiments carried out at Serere and Bukalasa, one of which, made to study the effect of various seed treatments on the amount of angular leaf spot and

blackarm that developed and also on the yield, consisted of two Latin squares side by side, each containing 16 sub-plots [cf. ibid., xiii, p. 161]. The treatments used were (1) delinting with sulphuric acid and then applying mercuric chloride solution *in vacuo*, (2) soaking in a culture of *Bact. malvacearum*, and (3) dusting with Dupont granosan, one lot of seed being left untreated as a control. A second test made to ascertain the relationship between the spread of angular leaf spot and the prevailing climatic conditions and to establish, if possible, a correlation between yield and the duration of infection consisted of a square of 55 by 55 holes spaced 3 by 3 ft., in the centre of which a square of 3 by 3 holes was sown with seed soaked in a culture of *Bact. malvacearum*, the rest of the plot being planted with seed sterilized by delinting in sulphuric acid and treating *in vacuo* with mercuric chloride solution. A third experiment, made to compare various types of blackarm in respect of their effect on yield, consisted of three blocks of twenty rows each of 24 plants planted 3 by 3 ft. The treatments applied were (1) inoculation with *Bact. malvacearum* on the basal monopodia after they had attained a length of six inches and (2) cutting them off at a similar stage; a number of plants were selected because of natural infection on the main stem.

The results obtained [which are tabulated, expressed graphically, and discussed] demonstrated that the stem form of blackarm significantly affected both yield and stand, while the leaf form of the disease had no effect upon yield. Dusting the seed with granosan increased the rate and percentage of germination and heightened the resistance of the plants to adverse conditions throughout the season. Seed inoculation with *Bact. malvacearum* reduced the stand, presumably because the early and heavy infection set up killed the young seedlings. The rate of spread was found to be closely correlated with rainfall, this factor being apparently that which has the greatest effect upon the cotton plant. Other climatic factors are so closely correlated with rainfall that their individual influence upon the spread of the disease cannot be determined. The direction of spread at Serere was roughly with the prevailing wind in situations where surface rain wash was prevented; the effect of surface rain wash was to modify or even obliterate the directional effect of rainstorms. The most important influence on yield in the tests was the extent to which the basal monopodia were developed. Early attack by *Bact. malvacearum*, if it occurs in such a way as to hinder the normal development of the monopodia, is likely to lead to severe damage with a resultant heavy loss of crop.

Dolichos lablab was very severely attacked by an unidentified fungus probably related to *Sphaceloma citri*. Lucerne was badly attacked at Serere by *Uromyces striatus* [ibid., ix, p. 187], while a considerable proportion of the plants were killed by *Sclerotium rolfsii*; this crop is not likely to be of much value in Uganda.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements. List of intercepted plant pests (List of pests recorded during the period July 1, 1932, to June 30, 1933, inclusive, as inter-

cepted in, on, or with plants and plant products entering United States territory).—pp. 2–3, 1934.

Among other interceptions made by officials of the plant quarantine administration of the United States Department of Agriculture during the period from 1st July, 1932, to 30th June, 1933 [cf. *R.A.M.*, xii, p. 335], the following may be mentioned: potato wart (*Synchytrium endobioticum*) in tubers from Bolivia and Peru [ibid., xi, p. 226]; a smut (*Polysaccopsis hieronymi*) on potato tubers from Venezuela; *Mycosphaerella pinodes* [ibid., xii, p. 740] on peas from Brazil and Japan; *Phyllosticta pisi* on peas from Germany; *M. rathayi* on grapes from Italy; and *Septoria ornithogali* var. *allii* on leeks (*Allium porrum*) from France.

KLEIN (G.) & ZIESE (W.). **Beiträge zum Chemismus pflanzlicher Tumoren. IV. Mitteilung: Über Peroxydase in pflanzlichen Tumoren.** [Contributions to the chemistry of plant tumours. Note IV: on peroxidase in plant tumours.]—*Biochem. Zeitschr.*, cclxvii, 1–3, pp. 22–25, 1933.

A tabulated account is given of the writers' determinations of the peroxidase content of healthy horse-radish rootstocks in comparison with that of those bearing tumours resulting from inoculation with *Bacterium tumefaciens* [*R.A.M.*, xii, p. 148]. It was found that the average peroxidase activity of the tumours (expressed by the amount of purpurogallin in the ether after extraction of the macerated root solutions with the admixture of 5 gm. pyrogallol and 50 mg. hydrogen peroxide by Willstätter's method) was more than double that of the other portions of the rhizome. The peroxidase activity of the healthy parts of tumour-bearing rhizomes was found to be comparable with that of normal material, indicating that the influence of the neoplasm does not extend beyond its immediate limits.

CIFERRI (R.) &. PARODI (E.). **Descrizione del fungo che causa la 'moniliasi' del Cacao.** [A description of the fungus causing 'moniliasis' of Cacao.]—*Phytopath. Zeitschr.*, vi, 5, pp. 539–542, 3 figs., 1933.

According to Rorer (*Informe Dept. Com. y Agric. E. U. N. America*, 13 pp., 1926), the cacao yield in an Ecuador plantation of 35,000 trees sank from 76,050 lb. in 1917 (when the disease was first seen in the country) to 22,916 in 1918 and 3,650 in 1919, followed in 1920 by the abandonment of the estate, in consequence of the *Monilia* disease [*R.A.M.*, xi, p. 434], which also occurs in Colombia [ibid., ix, p. 437]. Material sent from Guayaquil by the junior author was examined at the Palermo Botanical Institute by the senior writer.

The spots covering the fruits in part or completely measure 5 to 70 mm. in diameter and are yellowish, bluish, or greyish, of irregular shape with indefinite margins sometimes with a pale edging, and darker centres. Black stripes occur on the pericarp corresponding to disturbances in the vascular system, the mesocarp and central rachid are brown to blackish, while the mucilaginous sheath and the seeds are soft and watery, finally disintegrating completely. The internal mycelium of the fungus is tortuous, profusely branched,

hyaline, guttulate, and 2 to 2·5 μ in diameter, and the aerial mycelium is so densely ramified as to form a pseudostroma on the surface of the spots, composed of interwoven hyphae, 4 to 5 μ in diameter, with more slender apical branches (2 to 3·5 μ) or occasionally enlarged to 6 or 7 μ. The undifferentiated, cespitose to quasi-fasciculate conidiophores may be simple but are usually bi- or trifurcate at the base (mostly the former), hyaline, pluriseptate, often inequilateral and more or less straight, but as a rule slightly and irregularly undulate, 9 to 50 μ in length, and of the same breadth as the hyphae. The conidia vary in shape, being spherical to sub-cylindrical, ellipsoidal or elliptical-apiculate, more often spheroidal to sub-ellipsoidal, forming simple or irregularly branched chains of 2 or 3 to 20 or more, 7·5 to 10 μ in diameter or 9 to 14 by 8 to 10·5 μ. Some affinity between the *Monilia* of cacao and *M. seaveri* Reade (*Ann. Mycol.*, vi, p. 122, 1908) is evident, but the conidia of the latter are subglobose to citriform and furnished with disjunctors, while those of the related *M. angustior* (Sacc.) Reade (loc. cit.) are considerably larger. The cacao fungus is accordingly named *M. roreri* Cif. n.sp., with an abbreviated Latin diagnosis.

GAILITIS (L.). **Latvia: the destruction of Barberry and Buckthorn.**—*Internat. Bull. of Plant Protect.*, vii, 12, p. 269, 1933.

In accordance with a law passed by the Latvian Parliament on 11th March and published in the official gazette, *Valdibas Vestnesis* 65, 20th March, 1930, barberries (*Berberis vulgaris* and its var. *atropurpurea*) and buckthorn (*Rhamnus cathartica*) should have been completely eradicated throughout Latvia, except where authorized for scientific purposes, by 20th March, 1933, with a view to the control of the cereal rusts, *Puccinia graminis* and *P. coronifera* [*P. lolii*].

STEINER (H.). **Über Braunrost- (Puccinia triticina und Puccinia dispersa) Infektionen an abgeschnittenen Getreideblättern.** [On brown rust (*Puccinia triticina* and *Puccinia dispersa*) inoculations on cut cereal leaves.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 12, pp. 673–682, 1 fig., 1933.

The incubation period of *Puccinia triticina* on the leaves of the winter wheat varieties Dioseger 777, Fleischmann 481, Bànkut, and Strubes Dickkopf and the summer Roter Schlanstedter, cut off at regular intervals before and after inoculation at the Institute of Agronomy, Vienna, was at least a day shorter under comparable conditions than on the control plants inoculated and left on the plants in the ordinary way. Very early removal (four days before inoculation) of the leaves, however, prolonged the incubation period by a day as compared with the controls. The later the leaves were removed from the plants, the higher was the incidence of infection, a direct correlation existing between the latter and the colour and physiological activity of the foliage. Similar experiments with *P. dispersa* [*P. secalina*: *R.A.M.*, xiii, p. 82] on Tyrnauer and Swedish rye showed that a slight curtailment of the incubation period followed the removal of the leaves after inoculation.

GASSNER (G.) & KIRCHHOFF (H.). **Versuche zur Bekämpfung des Weizenflugbrandes mittels Benetzungsbeize.** [Experiments in the control of loose smut of Wheat by moistening.]—*Phytopath. Zeitschr.*, vi, 5, pp. 453–468, 2 figs., 1 graph, 1933.

In continuation of the experiments initiated by the first-named writer on the control of loose smut of wheat [*Ustilago tritici*] by moistening in closed vessels [*R.A.M.*, xii, p. 499], it was found that the best results were obtained by three to five hours' rotation of the seed-grain (Santa Fé variety) containers in a water bath at 50° C. The grain in the containers was moistened with 5 to 6 l. water per cwt. The addition of methylated spirit or isopropyl alcohol at low concentrations to the steeping water was found to enhance the efficacy of the treatment. By raising the temperature to 52·5° it is possible to curtail the duration of the treatment or reduce the quantity of liquid, whereas a drop to 47·5° necessitates a more protracted period and an additional amount of liquid added to the grain. In this series of trials the minimum length of time and quantity of liquid requisite for complete disinfection at 52·5° were three hours and 4·5 l. per cwt. grain, respectively. A slight diminution of the germinative capacity is a necessary sequence of the complete elimination of loose smut by this method, but less than has been reported for the ordinary hot water treatment. Further investigations on certain aspects of this line of control are in progress.

ROEMER (T.) & BARTHOLLY (R.). **Die Aggressivität verschiedener 'Steinbrandherkünfte' [Tilletia tritici (Bjerk.) Wint.] und ihre Veränderung durch die Wirtssorte.** [The aggressiveness of various 'bunt collections' [*Tilletia tritici* (Bjerk.) Wint.] and its modification by the host variety.]—*Phytopath. Zeitschr.*, vi, 5, pp. 469–506, 1933.

During the period from 1926 to 1932 the writers determined the degree of 'aggressiveness' [cf. *R.A.M.*, xiii, p. 262] of different bunt (*Tilletia tritici*) [*T. caries*] collections from Germany, Denmark, Switzerland, and the United States, and its modification by the host variety, the inoculations covering 364,582 wheat plants. The standard method of inoculation by heavy dusting of the seed-grain with bunt spores and subsequent planting in the open was found to give rise to serious discrepancies, and an improved method was therefore devised. The inoculated seeds were placed in earthenware dishes in damp soil, the moisture content of which was controlled by standing the dishes on roofing-paper and covering them with damp sacking and roofing-paper. One series of dishes was kept in the greenhouse and another in the cold frame. After four to five days the coverings were removed and after a further similar period the seedlings were planted out in the open. The lower temperatures of the cold frame were found to promote a higher incidence of infection than those prevailing in the greenhouse.

Continuing the experiments of Roemer (*Kühn-Arch.*, xix, 1, 1928), Gieseke, and Knorr [*R.A.M.*, viii, pp. 766–7], the six bunt collections of the above-mentioned origins were tested for their virulence on seven winter and six summer wheats (1931–2 only for the latter). Since 1927 the Cosel collection has consistently

proved the most aggressive, infecting even the relatively resistant Heils Dickkopf and Hohenheim 77 winter varieties to a maximum of 50·4 and 34·3 per cent., respectively, the corresponding figures for the semi-resistant Martin and Red Hussar being 77·3 and 49·6 per cent. The Breslau collection came next in order of aggressiveness, attacking the highly resistant Ridit more severely (4·9 to 11·8 per cent.) than any of the others. The Halle collection was found to be only moderately aggressive (except on Panzer III), and the foreign ones (especially that from the United States) showed comparatively weak aggressiveness. The Peragis summer variety proved highly susceptible in both years, the maximum infection in the cold frame in 1931 being 92·2 per cent. (American collection) and in 1932 89·5 per cent. (Halle). The Garnet and Vehandi (Finnish) varieties showed a fairly high degree of resistance in the former year, which was not maintained, however, in the latter. In both years selected hybrids of the Plant Breeding Station proved very resistant. In this connexion it is pointed out that the bunt collections used in the tests are mixtures and not 'pure lines', each collection comprising a population varying in aggressiveness towards the experimental material. It is incorrect, therefore, to apply the term 'physiologic races' to these collections.

Discussing the influence of a given variety on the bunt collection infecting it, the writer states that Hohenheim 77, for instance, exercises a selective capacity on the bunt population, developing lines from the Cosel collection which become progressively more virulent with every generation when tested on the same variety and Heils Dickkopf. This line of evidence is pursued at some length and considered to afford convincing proof of varietal capacity to modify the behaviour of the invading collections towards the same and other varieties.

GEACH (W. L.). **Foot and root rots of Wheat in Australia. The influence of the combined action of Fusarium culmorum (W. G. Sm.) Sacc. and Urocystis tritici Koern. on the occurrence of seedling blight.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 269–278, 1 pl. [opp. p. 308], 1933.

During the years 1930–1933 an unusual amount of seedling blight occurred at Canberra among wheat plants growing in a glass house in unsterilized soil from grain inoculated with *Urocystis tritici* in tests for varietal resistance to flag smut. Isolations from the affected plants gave *Fusarium* spp. (generally *F. culmorum*) or *Helminthosporium sativum*, or both. In an adjoining glass-house, wheat plants grown from grain inoculated with *F. culmorum* or in soil inoculated with *H. sativum* were less severely and less consistently attacked. Further experiments showed that the more severe attack in the first house was due to the combined effect of the smut and the root-rotting organism.

When grain was inoculated with a mixture of spores of *U. tritici* and conidia of *F. culmorum* more seedling blight occurred than when the grain was inoculated with either organism alone, both in the field and in pots of sterilized or unsterilized soil. Only a comparatively small amount of seedling blight occurred in the same environmental conditions on plants from grain inoculated with

only *F. culmorum* or *U. tritici*. For instance, in one such pot experiment in sterilized soil, out-of-doors, taking the control as 100, the percentage loss from seedling blight in the plants inoculated with *U. tritici*, *F. culmorum*, and both together was 2, 8, and 54, respectively.

In the field, wheat varieties highly resistant to *U. tritici* were only comparatively resistant to seedling blight caused by the combined attack of *F. culmorum* and *U. tritici*. These two organisms acting together under ordinary field conditions are partly responsible for poor stands.

BROADFOOT (W. C.). **On the pathogenicity of Wojnowicia graminis.**—*Phytopath.*, xxiii, 12, pp. 1001–1002, 1933.

Inoculation experiments with 34 isolations of *Wojnowicia graminis* [*R.A.M.*, xiii, p. 154] on the Kharkov and Marquis wheat varieties in Alberta, Canada, showed no conclusive evidence of pathogenicity on the part of the fungus [cf. ibid., xii, p. 685]. Measurements were obtained of 100 spores from a pycnidium on a winter wheat plant, the average size being 36 by 3·9 μ, with a range from 26·3 to 43·8 by 2·5 to 5·6 μ; the septa numbered 3 to 8 (average 6·8). The corresponding dimensions given by Van de Laar in Holland [ibid., x, p. 446] are 29·58 by 3·47 μ, with 5 to 7 septa.

HYNES (H. J.). **'Purple patch' of Wheat and Oats. A disease caused by the fungus Rhizoctonia solani.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 879–883, 4 figs., 1933.

In recent years wheat and oats in a south-western district of New South Wales have been affected by a disease locally known as 'purple patch', due to *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xii, p. 159]. The disease causes scattered unhealthy patches (purplish when viewed from a distance) which appear within three months of sowing and range from a foot in diameter to three-quarters of an acre or more in extent. The affected plants are stunted, stiff, erect, and show yellow and purple lower leaves. The primary and secondary roots are brown and extensively rotted. Many affected plants succumb when 2 to 5 in. high, while others may survive, but produce little grain. The disease is severest in winter, partial recovery sometimes occurring with the return of warm weather.

Inoculations with *C. solani* isolated from affected plants produced typical infection on wheat and oats. Barley and rye were also attacked with equal severity in the author's tests.

Very encouraging results were obtained in preliminary experiments on control by fertilizing with lime, sulphate of ammonia, or both together.

MACINDOE (S. L.), SHIRLOW (N. S.), & DARRAGH (W. H.). **Leaf or crown rust of Oats. Field observations on resistance of varieties.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 887–894, 2 figs., 1933.

In breeding tests conducted in New South Wales to obtain a variety of oats resistant to crown rust (*Puccinia coronata avenae*) [*P. lolii*], Victoria oats (of Argentine origin) [*R.A.M.*, xi, p. 498]

maintained complete immunity in three localities for three years. At one centre in 1933 several lines of Victoria × Richland showed very high resistance to black rust [*P. graminis*] with immunity from crown rust, while a White Russian selection, W 1950, also showed complete freedom from the latter. Bond (the result of a cross between *Avena sterilis* and Golden Rain) showed only 5 per cent. crown rust [ibid., xii, p. 269] but is a very late variety, susceptible to *P. graminis*.

Victoria, which is said to be possibly a hybrid between *A. sativa* and *A. sterilis*, and (to a less extent) Bond are considered to be the most suitable varieties to use in further crossing.

HIRSCHHORN (J.). **Dos royas de la Cebada, nuevas para el país.** [Two Barley rusts new to the country.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 166–167, 1932.

Two rusts were observed for the first time on barley in the Argentine in 1930, namely, *Puccinia anomala* and *P. glumarum* [*R.A.M.*, xi, p. 499], the former affecting the two-rowed varieties (*Hordeum distichon*) [ibid., x, p. 230] and the latter the four- and six-rowed (*H. tetrastichon* and *H. hexastichon*), as well as *H. spontaneum* and its var. *nigrum*.

MARCHIONATTO (J. B.). **Las 'helmintosporiosis' de la Cebada en la República Argentina.** [The 'helminthosporioses' of Barley in the Argentine Republic.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 107–114, 1 pl., 1 fig., 1932.

Notes are given on the symptoms and etiology of three barley diseases occurring in the Argentine Republic, viz., net blotch (*Helminthosporium teres*) [*R.A.M.*, xii, p. 163], leaf stripe (*H. gramineum*), and spot blotch (*H. sativum*), with brief descriptions of the causal organisms. The existence of *H. teres* in the country is stated to have hitherto passed unnoticed owing to its confusion with *H. gramineum*.

JOHNSON (L. P. V.). **Studies on the inheritance of covered smut reaction, lemma color, awn development and rachilla pubescence in Oats.**—*Canadian Journ. of Res.*, ix, 6, pp. 519–541, 1933.

A fully detailed and tabulated account is given of the writer's studies at the University of Alberta on the reaction to covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, xii, p. 562] and other characters of an oat cross, Black Mesdag × Victory. The F_3 was the only generation studied from the standpoint of smut reaction and the plants were grown from F_2 caryopses dehulled and inoculated with spores prior to sowing. Segregation for smut reaction among the F_3 families occurred in the ratio of 4 immune : 2 semi-resistant : 3 susceptible, and this is tentatively held to indicate that smut resistance is governed by two genetic factors—a dominant one, which when homozygous confers a high degree of resistance or

immunity and a weaker supplementary factor giving only partial resistance when homozygous.

Each of the grain characters, lemma colour, awn development, and rachilla pubescence, was found by a study of the F_2 and F_3 generations to be controlled by two genetic factors, but no correlation could be detected between these characters and smut reaction. Homozygous strains combining smut immunity with agronomically desirable grain characters were obtained.

The paper is supplemented by a bibliography of 42 titles and two appendices showing in tabular form the results of studies by previous workers on the inheritance in oat hybrids (A) of reaction to *U. kolleri* and *U. avenae*, and (B) of certain grain characters.

RENNERFELT (E.). **Undersökningar över strårötar hos våra sädesslag.** [Investigations on straw rots in our cereals.]—*Centralanst. för försöksväsendet på jordbruksområdet Medd.* 440, 16 pp., 1 pl., 2 figs., 2 graphs, 1 map, 1933. [German summary.]

The principal agents of foot rot among cereals in Sweden are stated to be *Ophiobolus graminis*, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, and *Hendersonia herpotricha*, the last-named being particularly common on the stubble. It is characterized by spherical, black, somewhat setose pycnidia, usually furnished with a long ostiole and containing olive-green, slightly curved, generally 7-septate pycnospores which are often embedded in liquid and extruded in a large ball through a crack in the pycnidial wall or in a vermiform filament through the ostiole. The rapidly growing mycelium is greyish-green. The symptoms produced on wheat by *H. herpotricha* are similar to those caused by *O. graminis*, which is much less common in Sweden. *O. graminis*, *O. herpotrichus*, and *H. herpotricha* are all most prevalent on wheat but occur also on barley and rye (*O. herpotrichus* occasionally on oats). It has been suggested that *H. herpotricha* is the pycnidial stage of *O. graminis*, but no proof of this has been furnished. Species of *Fusarium* and *Pleospora* have also been found causing straw rots of cereals in Sweden. In most cases two or more of the above-mentioned fungi may be observed jointly attacking the plants.

H. herpotricha, like *O. graminis*, is most virulent on wheat following barley [*R.A.M.*, xiii, p. 154]. Among the alternate hosts of *O. graminis* in Sweden are timothy [*Phleum pratense*], couch grass [*Agropyron repens*], sweet vernal grass [*Anthoxanthum odoratum*], and *Calamagrostis* spp. As in Germany [ibid., xi, p. 361], the damage caused by *O. graminis* in Sweden is most severe on the lighter types of soil. Meteorological conditions play an important part in the development of foot rots, to which the crops are predisposed by a cool, wet late spring to early summer, conditions that prevailed in Sweden during the period 1927–9 and occasioned heavy losses from these diseases. The normal or low rainfall and warm early summers of 1930–2 coincided with a virtual absence of foot rots, except where *O. herpotrichus* was involved, this organism having a higher optimum (25° C.) than *O. graminis* (20°). The cereal foot rots are most widely distributed in Skåne, but are also found in other southern and central districts. Control measures are briefly indicated.

WOLFF (F.). **Eine Laboratoriumsmethode zur schnellen Prüfung von Saatgutbeizmitteln (bes. zur Fusariumbekämpfung).** [A laboratory method for the rapid testing of seed-grain disinfectants (especially for *Fusarium* control).]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, x, 6, pp, 228–233, 3 figs., 1933.

A method has been devised for the rapid evaluation of the efficacy of seed-grain disinfectants, with special reference to those used against *Fusarium*, based on the observation of the germination and infection of rye seeds on Baltzer's starch-peptone-agar medium in Petri dishes inoculated by 30 minutes' immersion in a conidial emulsion of *Fusarium culmorum* [*R.A.M.*, x, p. 94]. From the second day after inoculation onwards, the mycelium of the fungus begins to spread over the insufficiently disinfected seeds, forming a dense, white aerial growth and turning the agar red, while the surface of the agar remains perfectly clear when the treatment has been effective. The use of an inferior disinfectant was shown to be accompanied by a serious reduction of germination.

LEPIK (E.). **Rukki seemne puhtimisest.** [An experiment on the disinfection of Rye seed-grain.]—*Mitteil. Phytopath. Versuchsstat. der Univ. Tartu*, No. 15, 5 pp., 1 fig., 1 graph, 1933. [German summary.]

In 1933 there was a heavier outbreak than usual of flag smut of rye (*Urocystis occulta*) in Esthonia, and the author gives some details of a series of experiments in Tartu [Dorpat], the results of which showed that rye seed-grain, naturally infected with the smut, was stimulated to give a very high germination percentage when treated by the sprinkling process with 0·25 per cent. or by the short disinfection ('Ge-Ka-Be') process with 1·5 per cent. germisan, or by sprinkling with 0·33 per cent. uspulun. Steeping the grain in 0·125 per cent. germisan or in 0·25 per cent. uspulun, while a little more effective in the control of the smut, was less stimulating in regard to germinability, while dusting with ceresan, which gave complete smut control, did not improve at all the germination of the contaminated seed, which was of 'average' quality.

IVANOFF (S. S.). **Stewart's wilt disease of Corn, with emphasis on the life history of Phytomonas stewarti in relation to pathogenesis.**—*Journ. Agric. Res.*, xlvii, 10, pp. 749–770, 3 pl., 2 figs., 1933.

This is a detailed account of the author's investigation [cf. *R.A.M.*, xii, p. 364] of Stewart's wilt disease of maize (*Phytomonas* [*Aplanobacter*] *stewarti*), in which particular attention was given to the life-history of the causal organism in relation to pathogenesis. The results of experiments at the Wisconsin Agricultural Experiment Station showed that the bacteria enter the host plant through bruised and wounded roots in artificially infected soil, no evidence being found of their entry through the broken pericarp of the seed-grain at the time of germination or into uninjured

roots. In the leaves and cob sheaths the bacteria were found in the vessels and in cavities caused by their disruption, in the intercellular spaces and substomatal chambers, and between cells in the place of the dissolved middle lamellae; all the tissues invaded were discoloured, plasmolysed, and dead. In the stem, peduncle, and cob rachis they were present in the vessels, in the large air spaces between some of the bundles, and in masses of disorganized pith. They were also observed in the whole vascular system of the tassels, and were isolated from the anthers and pollen of diseased plants. In infected maize grains they were located in the vascular system of the chalazal region, in cavities adjoining ruptured spiral vessels, between the outermost layer of the chalazal region and the aleurone layer, and between the cells of the endospermic tissue. The bacteria were further isolated from the exudate from all the diseased organs, as well as from the water which accumulated between the leaf blade and the ligule and at the base of young developing leaves. By employing a selective medium (glycerol 30 cc., ferric ammonium citrate 10 gr., sodium taurocholate 3 gr., sodium chloride 15 gr., sodium sulphate and dibasic potassium phosphate each 2·5 gr., calcium chloride 0·01 gr., magnesium sulphate 0·1 gr., agar 17 gr., and water to make 1 l., at P_H 7) the organism was recovered from overwintered maize stubble, decaying roots and stems, from the disintegrating parts of diseased seed-grains after germination in the soil, and from artificially infected soil.

REDDY (C. S.). **Resistance of Dent Corn to Basisporium gallarum Moll.**—*Iowa Agric. Exper. Stat. Res. Bull.* 167, pp. 4–40, 4 figs., 2 graphs, 1933.

This is a detailed account of the author's investigations into the resistance of Dent maize (*Zea mays* var. *dentiformis*) to *Basisporium gallarum*, an abstract of which has already been noticed [*R.A.M.*, xi, p. 448]. It is stated that the name *B. gallarum* is retained to cover the two species of *Nigrospora* reported on maize, *N. oryzae* and *N. sphaerica* [ibid., vi, p. 758], as both the small and the large spored forms were included in the tests, and the writer has some doubt whether they can be separated into distinct species on this basis alone.

EDWARDS (E. T.). **A new Fusarium disease of Maize. A preliminary note on the pathogenicity of Fusarium moniliforme (Sheld.) var. subglutinans Wr. & Rg., and on the occurrence of its hitherto unrecorded ascigerous stage, Gibberella fujikuroi (Saw.) Wr. var. subglutinans n. comb.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 895–897, 3 figs., 1933.

In May, 1932, perithecia of a *Gibberella* were collected on old maize stalks in New South Wales and found to contain straight, usually 1-septate ascospores with blunt, more or less rounded ends, apparently corresponding with Wineland's description of the ascospores of *G. moniliformis* [*R.A.M.*, xi, p. 222]. Similar material was collected from another locality a month later.

Cultural and morphological studies with single ascospore isolations showed, however, that the conidial stage was distinct from

Fusarium moniliforme and that it had close affinities with *F. moniliforme* var. *subglutinans*, with which it was later identified by Wollenweber, who reported that the perithecial stage of this fungus had not previously been described and suggested that it should be designated *G. fujikuroi* (Saw.) Wr. var. *subglutinans* n. comb. It differs from *G. fujikuroi* in having usually 8-spored asci, thinner ascospores, microconidia not in chains, and macroconidia smaller and less septate than those of *F. moniliforme* var. *majus*, the conidial stage of *G. fujikuroi*.

The pathogenicity of the organism on maize was established, and a survey showed it to be fairly widely distributed in the maize-growing areas of New South Wales. Numerous isolations demonstrated that the fungus is commonly carried internally in the grain.

This is thought to be the first record of *F. moniliforme* var. *subglutinans* as a parasite of maize.

KAMAT (M. N.). **Observations on Tolyposporium filiferum, cause of 'long smut' of Sorghum.**—*Phytopath.*, xxiii, 12, pp. 985–992, 4 figs., 1933.

Tolyposporium filiferum [*T. ehrenbergii*: *R.A.M.*, xi, p. 235], the agent of 'long smut' of sorghum in Tanganyika, Egypt, Mesopotamia (*Mesopotamia Dept. Agric. Admin. Rept. 1920*, 1921), and India, was studied on a number of standard liquid and solid media with special reference to its cultural characters and to the factors influencing germination of the spores.

Typical promycelia and sporidia were formed chiefly in the liquid media, especially sterilized distilled water, while on solid substrata branched germ-tubes giving off aerial conidia, either in long chains or in clusters at the tips of short, pointed, thorn-like branches, were commonly produced. The fusiform sporidia measured 8 to 24 μ in length and the aerial conidia 4 to 8 μ. The optimum temperature for spore germination was found to be about 28° C., 33° being almost as favourable; the minimum and maximum are 10° to 13° and just above 39°, respectively.

Considerable differences were observed between some of the monosporidial lines of the smut with regard to colony colour (pale cinnamon-pink, buff, or ivory-yellow), topography (raised, rugose, broadly or finely ridged, or furrowed), surface (dull or waxy), margin (wavy or lobate), consistency (membranous, leathery, or yeast-like), and diameter (37·5 to 50 mm.). Generally speaking, the membranous consistency, pale colour, regular margins, and fine ridging were associated with the higher temperature ranges.

MANDELSON (L. F.). **Citrus psorosis control.**—*Queensland Agric. Journ.*, xl, 6, pp. 504–507, 1 fig., 1933.

After stating that a suspected case of citrus psorosis was first observed in Queensland in 1927, since when the disease has been reported from five other localities in the State [cf. *R.A.M.*, x, p. 161], the author gives a brief, popular account of the disease and describes the Californian method of control by scraping away the

affected bark and painting the exposed surface with a mixture of 1 gall. concentrated lime-sulphur and 2 galls. lime paste (prepared by slaking 3 lb. quicklime in 1 gall. water) or with one made by slaking a known weight of quicklime while slowly sifting into it an equal weight of flowers of sulphur, stirring constantly, and adding enough water to make a smooth paste [ibid., xii, p. 89].

Zinc-lime as substitute for Bordeaux as brown rot spray.—*California Citrograph*, xix, 2, p. 53, 1933.

One season's experiments in California indicated that considerable control of citrus brown rot [*Phytophthora citrophthora*] is given by the zinc sulphate-lime spray proposed as a substitute for Bordeaux mixture [*R.A.M.*, xii, p. 690], provided the spray contains sufficient zinc. The strength recommended is 8–4–50 (8 lb. zinc sulphate, 4 lb. lime, and 50 galls. water), the sulphate employed being that with 7 molecules of water (i.e., 22·7 per cent. zinc). A prepared powdered zinc sulphate-lime mixture is also available.

Spraying should be effected after the first rain, and the whole tree may be thoroughly wetted.

Growers are warned against using too much zinc sulphate without lime as a neutralizing agent.

STOUGHTON (R. H.). **The influence of environmental conditions on the development of the angular leaf-spot disease of Cotton. V. The influence of alternating and varying conditions on infection.**—*Ann. of Appl. Biol.*, xx, 4, pp. 590–611, 1933.

The results of the controlled experiments described in this, the last instalment of this series [*R.A.M.*, xii, p. 22], indicated that, all other factors being equal, the development of primary infection of cotton seedlings by *Bacterium malvacearum* was chiefly governed by the mean soil temperature at the time of sowing and for the first few days of germination [ibid., vii, p. 95; x, p. 651], subsequent variations in this factor having little effect on the incidence of the disease. Primary infection was also found to be higher at soil moisture contents approaching the saturation point for a given type of soil, and to vary at a given soil temperature and soil moisture with the type of soil. The amount of secondary infection (by spraying the young cotton plants with a suspension of the organism) was shown to depend on the mean air temperature prevailing during the incubation period of the disease, the actual temperature at the time of inoculation being unimportant, while atmospheric humidity was important only during a short period (less than 48 hours) following inoculation, in that it controlled the time during which the infective droplets persisted on the leaves; variations in atmospheric humidity had little direct effect on the further progress of the disease after its establishment. Cotton plants kept in total darkness were relatively resistant to infection.

Fluctuating soil and air temperatures had the same effect in these experiments as a constant temperature near the mean of the variations, so that the latter figure can be used in studying the effect of temperature on the disease.

KALANDRA (A.) & ROZSYPAL (J.). **Několik poznámek o puklici švestkové (Lecanium coryli) na Jasanech a na ní cisopasících houbách.** [A few notes on the Plum tree scale insect (*Lecanium coryli*) on the Ash, and on the fungi parasitizing it]—*Ochrana Rostlin*, xiii, 5–6, pp. 153–176, 2 pl., 1 fig., 1 map, 1933. [German summary.]

The main part of this paper deals with studies on the host range and control of the scale insect *Lecanium coryli*, which is stated to have occurred in epidemic form in pure and mixed ash (*Fraxinus* spp.) stands in Czecho-Slovakia from about 1922 to 1932. In the last two years, however, this pest has almost completely disappeared all over the country, presumably chiefly owing to biological control by numerous insect and fungal parasites. The two most important insectivorous fungi concerned have been determined as *Cordyceps pistillariaeformis* [*R.A.M.*, ix, p. 454] and *Cephalosporium* (*Acrostalagmus*) *lecanii* [ibid., ix, p. 33], morphological details of which are given. Both fungi chiefly attack young females just before the second moult, while the scale is still soft; males are very rarely attacked, owing to the protection offered by their thick scale. *C. pistillariaeformis* appeared to be most active during the spring and autumn, while *C.* (*A.*) *lecanii* killed most of the insects during the autumn, when it also infected the larvae. Artificial infection experiments in the greenhouse, in which young stages of the insect were either sprayed or brushed with spore suspensions of the two fungi, resulted in only a very few infections. In nature the mycelia and fructifications of both fungi, especially the still immature coremia of *C. pistillariaeformis* were seen to be destroyed in large masses by a mite (*Histiogaster* sp.), which is considered to be partly responsible for the almost total disappearance of these two species from the field in 1933.

MARCHIONATTO (J. B.). **Nota sobre 'Sporotrichum globuliferum' Speg.** [A note on *Sporotrichum globuliferum* Speg.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 39, pp. 348–350, 2 figs., 1933.

Attention is drawn to the parasitic occurrence on migratory locusts [*Schistocerca paranensis*] in the Argentine of a new species of *Sporotrichum*, *S. paranense*, a full description of which is stated to be in the press. The fungus under observation, which was first observed by the writer in 1932, is stated to be distinguishable from *Beauveria globulifera* (*S. globuliferum*) [*R.A.M.*, xii, p. 217] by its morphological and cultural characters as well as by the mode of attack on the insects. The new species is characterized by green conidia, whereas those of *B. globulifera* are white and quite differently distributed on the conidiophores. The latter organism was first described from the Argentine in 1898 (*Informe Annual Ofic. Nac. Agric.*) on the basis of studies made by L. Bruner and C. F. Bessey in the previous year.

OTA (M.) & KAWATSURÉ (S.). **Sur le Sabouraudites ruber et ses variétés.** [On *Sabouraudites ruber* and its varieties.]—*Ann. de Parasitol. Humaine et Comp.*, xi, 6, pp. 476–501, 2 pl., 1 fig., 1933.

The authors state that comparative studies of material of various

origins showed that *Sabouraudites ruber* [*R.A.M.*, xii, p. 443] is highly variable in its morphological and cultural characters, for which reason it has been frequently described under other names, namely, *Epidermophyton rubrum* Castellani 1909 [ibid., xiii, p. 164], *Trichophyton purpureum* Bang 1910 [ibid., xii, p. 509], *T. rubidum* Priestley 1917 [ibid., xii, p. 569], '*T.A.*' Hodges 1921, *E. salmoneum* de Mello 1921 [ibid., xi, p. 44], *T. multicolor* de Magalhaes et Neves 1923 [ibid., vii, p. 376], *E. plurizoniforme* L. MacCarthy 1925, *E. lanoroseum* L. MacCarthy 1925 [ibid., x, p. 730], *Sabouraudites ruber* var. III Fuji 1932 [ibid., xii, p. 94], all of which are considered to be synonymous with *S. ruber*.

Strains typical of *S. ruber* produce, besides simple sporiferous hyphae, pyriform aleuria and multilocular spindle-shaped bodies in culture. Pectinate bodies and intercalary or pediculate chlamydospores are also formed. The colonies may be purple, red, lilac, occasionally spotted with creamy or sulphur yellow or yellowish-green, while some strains always remain white, and are distinguished under the name var. *albus* Ota et Hashimoto 1930. Other strains lack the spindle-shaped bodies and are provisionally classed as var. *acloster*; this variety may be divided by the aspect of the cultures into such types as *kagawanensis* (or *ruber*), *coccineus, lilaceus, albus*, and the like. Notes are also given on certain species allied to *S. ruber*.

The authors state that they accept the suppression of the genera *Endodermophyton, Bodinia*, and *Grubyella* proposed by Langeron & Milochevitch [ibid., x, p. 243].

LEBASQUE (J.). **Les champignons des teignes du cheval et des bovidés.** [The fungi of equine and bovine ringworms.]—Thèse Doct. ès Sci. Nat., Paris, 1933. [Abs. in *Bull. Inst. Pasteur*, xxxii, 2, pp. 69–70, 1934.]

As already shown by Brocq-Rousseu and his collaborators, equine dermatomycosis is due predominantly to *Microsporon* (*Sabouraudites*) spp. [*R.A.M.*, v, p. 555], whereas *Trichophyton ochraceum* [ibid., vi, p. 484] was found to be responsible for 53 per cent. of the bovine cases examined.

Four new species are described, namely, *Sabouraudites lanatus* and *T. bullosum* on horses, *T. villosum* and *T. papillosum* on cattle.

The occurrence of 'vrilles' [terminal spirals] has been demonstrated in *S. equinus* (*M. equinum*) and *T. equinum* [ibid., x, p. 243]. The cattle parasites, *T. album* [ibid., xi, p. 374; xii, p. 219], *T. discoides, T. ochraceum*, and *T. papillosum*, as well as *T. bullosum* from horses, all characterized by smooth colonies on Sabouraud's medium, produce a downy growth on barley and wheat grains and on droppings [cf. ibid., vii, p. 720], and develop certain morphological characters (*Acladium* conidial type or cruciform branches, spindles, and sometimes 'vrilles') not hitherto observed in the smooth dermatophytes. There are thus no grounds for maintaining the distinction between the downy and smooth species of *Trichophyton*, the latter falling naturally into the family of Gymnoascaceae as proposed by Langeron and Milochevitch [ibid., x, p. 242]. In the writer's opinion, the bovine ringworm fungi

live as saprophytes on grains and refuse and can infect young animals from these sources during the winter quite apart from contact with a diseased subject.

EMPEY (W. A.) & VICKERY (J. R.). **The use of carbon dioxide in the storage of chilled beef.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 233–243, 1933.

Frozen meat supplied to Great Britain from Queensland, which furnishes about 85 per cent. of the Australian exports, is some 60 days from slaughter to arrival as against about 25 days from countries supplying chilled beef, and if freezing is to be avoided means must be found to check the proliferation of bacteria and moulds on the superficial tissues at temperatures above the freezing point (which is −1° C. for beef) as deterioration is almost wholly due to these.

The percentage of 'low temperature micro-organisms' (i.e., organisms capable of comparatively rapid growth at about −1°) was determined by comparing the numbers of superficial organisms from beef viable on artificial media at incubation temperatures of 20° and −1°. The low temperature bacteria found initially on the beef consisted of at least 95 per cent. of types belonging to *Achromobacter*, the remainder being species of *Pseudomonas* and *Micrococcus*. In all the tests the counts of low temperature moulds obtained immediately after slaughter and after the completion of chilling were extremely low compared with the counts of low temperature bacteria. In one test, after 42 days' storage, no visible mould was present on beef stored in atmospheres of 10 to 12 per cent. carbon dioxide [cf. *R.A.M.*, xiii, p. 97], whereas beef stored in air had an average population (per area of 2 sq. cm.) of 50 to 60 colonies, mostly *Penicillium expansum*, though *Sporotrichum carnis* was also present. Quarters of beef stored in 12 per cent. carbon dioxide even for 55 days showed only 3 or 4 colonies per quarter, all of *S. carnis*.

To restrict microbial growth on stored chilled beef the temperature should be maintained as near as possible to the freezing point of the muscle tissue, i.e., −1°. The use of 10 to 12 per cent. carbon dioxide in the storage atmosphere increased the storage life of chilled beef from meat-works where the initial contamination consists chiefly of *Achromobacter* by 40 per cent., as compared with storage in air, effectively controlled *P. expansum* and most other meat moulds, and moderately restricted the growth of *S. carnis*.

GROOM (P.) & PANISSET (THÉRÈSE). **Studies on Penicillium chrysogenum Thom, in relation to temperature and relative humidity of the air.**—*Ann. of Appl. Biol.*, xx, 4, pp. 633–660, 1933.

The authors state that the mildew which in most cases affects book materials preserved at the Public Record Office, London, was found to be caused by a species of *Penicillium* which they determined in accordance with Thom's classification ('*The Penicillia*') [*R.A.M.*, ix, p. 410] as *P. chrysogenum*. Controlled experiments [details of which are given] showed that the conidia of this fungus germinate in atmospheres with a relative humidity ranging from

100 to 81 per cent., and at temperatures from 1° to above 35° but below 40° C., with an optimum at about 26°. In atmospheres with a relative humidity of 0 and 26 per cent. the conidia survived exposure to a temperature of 30° for over 129 days; at constant temperatures above 40° the time required to kill them was found to decrease with the rise of relative humidity, while at the same relative humidity it decreased with a rise in temperature.

GUTNER (A. S.). Грибы — паразиты оранжерейных растений городов Ленинграда и Детского Села. [Fungal parasites of glasshouse plants in the towns of Leningrad and Dyetskoye Selo.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 285–323, 2 pl., 1933. [German summary.]

An annotated list is given of some 120 species of fungi (arranged in alphabetical order of the scientific names of the hosts) which were found in 1929–30 parasitizing glasshouse plants in Leningrad and Dyetskoye Selo. Of the thirty species (including one belonging to a new genus, *Diplochorina*) which are described as new to science, and of which the Latin diagnoses are given, the following may be mentioned. *Septogloeum amarylli* causes elongated, diffuse, wine-coloured spots on *Hippeastrum* leaves, which are eventually killed; it forms submerged, gregarious acervuli, 90 to 150 μ in diameter; the spores are oblong or irregularly elongated, hyaline or greenish, indistinctly one- to three-septate, and 7·5 to 18 by 3 to 4·5 μ. *Guignardia araliae* produces on dead branches of *Aralia pulchra* spherical, dark brown, ostiolate perithecia, with clavate, sessile, or subpedicellate asci, 60 to 72 by 9 to 11·2 μ in diameter; the ascospores are distichous or subdistichous, elongated, frequently inequilateral, curved, with obtuse ends, tapering towards the base, and 15·4 to 19·2 by 3·2 to 4·9 μ. *Gloeosporium araliae*, on the same substratum, forms gregarious, elliptical, brownish-red, subepidermal acervuli; the spores are greenish, clavate, elongated or irregular, and 12·8 to 13·4 by 4·8 to 7·2 μ. *Vermicularia araliae* was found on shed leaves of *Aralia* spp. forming round, setose, black, hypophyllous (occasionally epiphyllous) acervuli, with subulate, dark brown, septate setae, swollen at the septa, and 225 to 315 by 4·5 μ in diameter; the spores are continuous or two-celled, greenish, sickle-shaped, with pointed or obtuse ends, and 19·2 to 27 (rarely 35) by 3·2 to 4·5 μ. *Guignardia dracaenae* forms on living leaves of *Dracaena latifolia* numerous elliptical, greyish or yellowish, frequently confluent spots, 1·5 to 6 by 0·8 to 1·5 cm. in diameter, with a thick, raised, light brown margin; the affected tissue eventually dies and falls out. The perithecia are amphigenous, submerged, spherical, black, and 100 to 120 μ in diameter. The asci are sessile, spindle- or club-shaped, frequently curved, and 48 to 54 by 9 μ; the spores are oblong, inequilateral, tapering towards the base, greenish, distichous or subdistichous, and measure 15 to 18 by 4·5 μ. *Phyllosticta oleandri* causes on living leaves of *Nerium oleander* diffuse, irregular, concentrically zoned, at first greenish but later greyish spots. The pycnidia are epiphyllous, disposed in concentric rings, black, and 270 to 300 μ in diameter. The spores are ellipsoidal or ovate, and 3·7 to 6 by 2 to 3 μ.

Ascochyta laurocerasi forms on the living leaves of *Prunus laurocerasus* large, shapeless, brown spots extending over the greater part of the blade. The pycnidia are dispersed, epiphyllous, submerged. The spores are elliptical, bacillar, hyaline, straight, indistinctly one-septate, rounded at both ends, and 6 to 10 by 2·2 to 3 μ. The paper terminates with an index of all the species recorded.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **A new Hollyhock rust.**—*Mycologia*, xxv, 6, pp. 509–512, 3 figs., 1933.

Hollyhocks in Texas were severely attacked in 1932 by a rust, the pustules of which occurred in profusion on all parts of the leaves, petioles, flowers, seed bracts, and seeds. Sori resulting from secondary infection were formed in concentric circles surrounding the older, central sori. The pustules were covered by a thin, mildew-like growth consisting of promycelia and sporidia from the germinating teleutospores, which were mostly uni-, occasionally bicellular and quite distinct from those of the common hollyhock rust, *Puccinia malvacearum*, the symptoms caused by which are also different [*R.A.M.*, x, p. 259]. The causal organism was identified as *P. heterospora*, known to occur on other Malvaceae in California, South America, and the West Indies, but apparently not hitherto recorded on the hollyhock. The fungus has previously been observed in Texas on *Sida* spp. and its sudden appearance on hollyhocks may indicate the development of a new physiologic form. Inoculation experiments on healthy hollyhock plants gave positive results.

RUDORF (G.) & JOB (MARIA M.). **Noticias sobre una bacteriosis en cultivos de Alhelies 'Matthiola incana' var. 'annua'.** [Notes on a bacteriosis in plantings of Stock (*Matthiola incana* var. *annua*).]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 122–127, 4 figs., 1932.

Stock (*Matthiola incana* var. *annua*) plants at the Phytotechnical Institute of Santa Catalina, Argentine Republic, were observed in July, 1931, to be affected by a bacterial disease characterized by a yellow to coffee-coloured discoloration and rolling of the leaves and a longitudinal cracking of the stems, sometimes involving not only the cortex but also the central cylinder. Plants attacked in the juvenile phase are stunted; the development of the floral racemes is retarded and the rachids shortened, while the leaves surrounding the inflorescences are generally folded. The root system presents no apparent abnormalities, but the yellow liquid in the wood vessels of the roots, stem, and leaves contains bacteria. Infected stems turn black and the wood vessels and pith become entirely disorganized, while the petiole, leaf veins, and chlorenchyma are similarly involved.

According to Stapp in Sorauer's Handbook of Plant Diseases, Ed. 5, ii, p. 120, Briosi and Pavarino investigated a bacterial disease of *Matthiola* and wallflower (*Cheiranthus cheiri*) [in Italy], the symptoms of which correspond in all particulars with those described above. The Argentine disease is accordingly attributed to *Bacterium*

matthiolae Bri. & Pav. The Italian workers found that infection occurred through wounds in the roots, and the writers' observations and experiments at Santa Catalina supported their conclusion. Inoculation of the soil with suspensions of the causal organism in pure culture gave positive results. The most promising line of control appears to be the development of resistant varieties.

GILL (D. L.). **Plasmopara halstedii on Cineraria.**—*Mycologia*, xxv, 6, pp. 446–447, 1933.

Some 10 per cent. of the cineraria (*Senecio cruentus*) plants in a Long Island greenhouse were attacked in 1932 by a downy mildew which caused a considerable loss. The spots, up to about 3 cm. in diameter, are white on the under sides of the leaves and slightly browned on the upper. The diseased foliage soon dies. The conidiophores of the causal organism were 247 to 640 μ in length (mean $385{\cdot}44 \pm 8{\cdot}23\ \mu$) and the conidia measured 15 to 30 by 13 to 23 μ ($19{\cdot}67 \pm 0{\cdot}286$ by $16{\cdot}59 \pm 0{\cdot}199\ \mu$). These dimensions are rather smaller than those given by Wilson (*Bull. Torrey Bot. Club*, xxxiv, p. 387, 1907) for *Plasmopara halstedii* [*R.A.M.*, viii, p. 579] with which, however, the cineraria fungus (apparently a new record) is considered to be identical in view of its general morphological agreement. Specimens of *P. halstedii* from *Bidens frondosa* and *Rudbeckia hirta* were found to be clearly identical with the fungus observed on *S. cruentus*.

CHRISTOFF (A.). Една нова бактерийна болесть по Мака за опиумъ причинявана отъ **Bacillus (Erwinia) papaveri n. sp.** [A new bacterial blight of Opium Poppy caused by *Bacillus* (*Erwinia*) *papaveri* n. sp.]—Reprinted from *Journ. Agric. Exper. Stations in Bulgaria*, Sofia, v, 9–10, 31 pp., 8 pl., 1933. [English summary.]

This is a full account of the author's studies on the bacterial blight of the opium and other poppies in Bulgaria caused by *Bacillus* (*Erwinia*) *papaveri*, a preliminary report of which has already been noticed [*R.A.M.*, xi, p. 745]. On *Papaver somniferum* and *P. alpina* the disease was observed in the field, while *P. orientale* was successfully inoculated with it. Entry occurs through the stomata, and extension is chiefly through the intercellular spaces around the phloem and xylem parenchyma cells and the bast fibres. In addition to the information previously given, it is stated that the organism was shown to be very resistant to desiccation, retaining its viability on cover glasses kept dry in the dark for months on end; on potato agar it was found to be still infective to poppy at the end of three years. Its thermal death point was established at about 48° C.

The investigation showed further that the disease is distributed chiefly through infected seed, which is reached by the organism both from the stem and through the pod wall. The control measures recommended are the use of healthy seed, removal of diseased plants from the fields as soon as they appear, as well as of the stubble remaining from the preceding crop, and crop rotation, where practicable.

BUCHWALD (N. F.). **To for Danmark nye bakterioser paa prydplanter.** [Two bacterioses of ornamentals new for Denmark.] Reprinted from *Gartnertidende, 1933*, 45, 3 pp., 3 figs., 1933.

The organism recently isolated from Optima begonias in Denmark suffering from the bacteriosis reported some years ago on the Gloire de Lorraine variety [*R.A.M.*, viii, p. 752], and occurring sporadically since then, is named *Bacterium begoniae* n. sp. ad. int. It is rod-shaped and measures 1 to 1·5 by 0·5 μ. The general type of infection is closely similar to that caused by *Bact. campestre* [*Pseudomonas campestris*] on cabbage, the symptoms including a pale to leaden, water-soaked discoloration of the foliage, blackening of the leaf veins, and eventual wilting, accompanied by rotting of the stems from the base upwards. Judging by analogy, the pathogen probably enters the leaves through the marginal pores and the stems through basal wounds. Cultural measures for the control of the disease are briefly indicated.

Barberries (*Berberis vulgaris* and its var. *atropurpurea*, *B. canadensis*, and other varieties) were attacked in 1933 by *Phytomonas berberidis*, previously reported from the United States [ibid., xi, p. 109].

HOOG (J.). **The breaking of Tulips.**—*Gard. Chron.*, xciv, 2452, p. 471, 1933.

The discovery in 1675 by an English botanist named Balgrave that 'breaking' of tulips [*R.A.M.*, xii, p. 633] could be induced by grafting a portion of an affected on a sound bulb (*Gard. Chron.*, xciv, p. 391, 1933) is stated to have been anticipated in Holland. A book published at Haarlem in 1637, dealing with the tulip cult which reached its climax about that time, contains a dialogue between allegorical personages, one of whom explains how the desirable 'striped and feathered' effect may be obtained by placing a slice of a bulb possessing a flower with these characters in contact with a normal one from which a similar slice had been removed.

WEST (E. F.). **Another powdery mildew on Crape Myrtle.**—*Phytopath.*, xxiii, 12, pp. 1002–1003, 1933.

Since the writer's recent statement to the effect that *Erysiphe lagerstroemiae* is the only powdery mildew of which the perfect stage has been recognized on crape myrtle [*Lagerstroemia indica*] in the United States [*R.A.M.*, xiii, p. 168], specimens of *Phyllactinia corylea* [ibid., xii, p. 395] on mildewed leaves of the same host have been received from Alabama.

CURZI (M.). **L'Ascochyta heteromorpha n.c. nella necrosi dell'Oleandro e nell'inoculazione sperimentale.** [*Ascochyta heteromorpha* n.c. in Oleander necrosis and in experimental inoculation.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 3, pp. 380–426, 10 pl., 21 figs., 1933.

In this detailed description of a wilt and spotting of the young green shoots of oleanders (*Nerium oleander*) near Rome the author states that though generally only a few of the twigs and leaves are affected, sometimes nearly all the year's shoots are killed. Infection usually causes a small area of necrosis at the leaf axil,

the toxic products liberated by the fungus spreading along the midrib and the upper part of the twig, with the result that considerable areas develop necrosis without any actual invasion by the mycelium. The area of infection on the twigs shows light to dark brown, zonate spots; on the leaves direct infection causes large spots, whitish in the middle and chestnut or bay at the edges, usually showing concentric zonation. On the flowers and fruit infection generally starts at the peduncles and causes dark chestnut to nearly black, elongated, depressed spots. Attack is most injurious in autumn, atmospheric humidity favouring infection and greatly increasing the production and diffusion of the causal organism.

Hyaline to olivaceous or occasionally brown hyphae, 3·5 to 9 μ in diameter, permeate the tissues of the spots and produce light fuliginous, more or less immersed pycnidia, 110 to 200 μ in diameter, or if formed in a damp chamber 280 to 400 by 200 to 270 μ. The spores, which arise as bud-like outgrowths from the inner cells of the pycnidium, are hyaline, oval or piriform, biguttulate, and when mature may become 1-septate. Frequently, however, nearly all the spores in a pycnidium were continuous, though on fruits still attached to the trees and others kept in a damp chamber 60 and 3 per cent. of the spores, respectively, were septate. The spores range from 4 to 10 by 1·8 to 3·5 μ (when mature mostly 6·5 to 8 by 2·5 to 3·25 μ). The author refers the organism to *Ascochyta heteromorpha* (Sch. et Sacc.) n.c. (*Phoma ? heteromorpha* Sch. et Sacc , 1884, *P. oleandrina* Delac., 1905).

Artificial inoculations of oleanders either by sprinkling with an aqueous solution of the spores or by inserting pieces of mycelium under the bark gave positive results, the latter method causing the fungus to develop parasitically on 2- to 3-year-old branches, which escape natural infection. Inoculations of the young fleshy parts of about 70 [named] species of phanerogams also gave positive results, though the fungus was less virulent than on the oleander.

A bibliography of 25 titles is appended.

BONGINI (VIRGINIA). **Macchie di seccherecio delle foglie di Edera.** [Dry spotting of Ivy leaves.]—*La Difesa delle Piante*, x, 6, pp. 123–130, 1 pl., 1933.

All varieties of ivy (*Hedera helix*) in Italy, and especially *H. helix* var. *conglomerata* when grown under glass, are liable to severe injury from a disease characterized by dry, circular, depressed spots up to 2 cm. in diameter (surrounded by a raised brown margin visible only on the upper surface) on both surfaces of the leaves, but principally near the edge of the upper surface. These spots often coalesce and cover the whole blade, the leaf becoming yellow and thickened. Occasionally, they may spread to the peduncles and shoots.

The causal organism [the morphological characters of which are fully described] is *Colletotrichum trichellum* (Fries) Vogl. (syns. *Vermicularia trichella* Fries., *C. hederae* Pass., *C. hedericola* Laub., *Amerosporium trichellum* (Fries) Rostr.) [*R.A.M.*, viii, p. 268].

The paper terminates with brief notes on control and there is a bibliography of 18 titles.

GROSS (J.). **Die Spitzendürre unserer Obstbäume.** [The tip die-back of our fruit trees.]—*Gartenflora*, lxxxii, 12, p. 351, 1933.

Attention is drawn to the prevalence of a virulent form of *Fusicladium* [*Venturia inaequalis* and *V. pirina*] on apple and pear trees in the Lake of Constance district and in the Grisons [Switzerland], the most prominent feature of which is a die-back of the branch tips. Care must be taken to avoid confusion between this disease and canker [*Nectria galligena*: *R.A.M.*, xi, p. 247], which frequently occurs on the same tree and even on the same branch. Among the apple varieties liable to this tip die-back are Luiken, Canada and Baumann's Pippins, and Winter Golden Pearmain, while the Pastor and other pears are similarly affected. Predisposing causes of infection are a high ground water level, impermeable, heavy or excessively light soils with an insufficient lime supply, a superabundance of nitrogen (especially from liquid manure), and various cultural errors.

FOLSOM (D.). **Apple spraying and dusting experiments 1928 to 1932 in relation to scab, yield, and tree growth.**—*Maine Agric. Exper. Stat. Bull.* 368, pp. 417–501, 6 figs., 5 graphs, 1933.

A detailed account is given of a comprehensive series of spraying tests conducted in Maine from 1928 to 1932, inclusive, against scab [*Venturia inaequalis*] on McIntosh apple trees, the effect of the various treatments on the leaves, fruits, stem growth, and yield being fully discussed [cf. *R.A.M.*, viii, p. 652].

A spray schedule not containing a mid-blossom and a 6-week application was weak in scab control. Flotation sulphur proved inferior to dry lime-sulphur in scab control but caused less injury to leaves and fruit. The replacement of lime-sulphur by calmosul (containing about 65 per cent. calcium monosulphate), at the rate of 6 lb. in 50 galls., after bloom was disadvantageous (71 per cent. scabbed fruits). The addition of iron sulphate to lime sulphur at the calyx and 2-week applications proved slightly beneficial in reducing leaf and fruit scab and spray injury in 1931, and when included in the 2-, 4-, and 6-week applications in 1932 was decidedly advantageous. The amount of leaf scab present in June was found to influence that found in July, which in turn largely determined that in August; the amount of leaf scab also governed the amount of fruit scab. Storage scab appeared to be reduced to insignificant proportions by late spraying in August. Twig infection was prevalent in some seasons, and spread from the twigs to the leaves was not prevented by dormant spraying with lime-sulphur or an oil spray.

In discussing the effect of the different applications on growth and yield [full data on which are given] the conclusion is reached that the effect of lime-sulphur spray injury upon these may be much less than is commonly supposed, especially in comparison with the effects of soil variation or of uncontrolled scab. In some cases the most injured trees had the best yield, presumably because of most effective scab control.

Growers in Maine in order to secure the best control of scab on McIntosh trees without russeting or reduction of yield are recommended to use lime-sulphur in preference to the other materials tested.

A 7-page bibliography is appended.

CHEAL (W. F.). **Apple scab spraying experiments in the Wisbech area: the times of application. II.**—*Journ. Min. Agric.*, xl, 9, pp. 805–808, 1933.

During the very dry season of 1933 four plots of Emneth Early (Early Victoria) apples growing in the Wisbech area of Cambridgeshire were sprayed against scab [*Venturia inaequalis*] with lime-sulphur as follows: plot 1, at the 'green flower' stage [*R.A.M.*, xii, p. 452], pink bud, petal fall, and two or three weeks later; plot 2, as the preceding, but omitting the final application; plot 3, unsprayed; plot 4, at pink bud, petal fall, and two or three weeks later. The concentration used was 1 in 30 for the pre-, and 1 in 60 for the post-blossom applications, lead arsenate being added at petal fall.

When the apples were gathered, the percentage of scab in the four plots was, respectively, 0, 0·6, 10·9, and 3·7, demonstrating that in the locality concerned spraying at the green flower stage is advisable even in an exceptionally dry period.

BLISS (D. E.). **The pathogenicity and seasonal development of Gymnosporangium in Iowa.**—*Iowa Agric. Exper. Stat. Res. Bull.* 166, pp. 339–392, 8 pl., 11 figs., 2 graphs, 1933.

Of seven species of *Gymnosporangium* occurring in Iowa only *G. juniperi-virginianae* and *G. globosum* [*R.A.M.*, xii, pp. 452, 704] are common. The latter is of small economic importance, but the loss caused by an epidemic of the former in the apple crop in 1928 is estimated at $200,000.

Air-dried galls bearing teleutospores of *G. juniperi-virginianae* soaked in water for periods ranging from 30 to 180 minutes required 6 to 7 hours to produce abundant sporidia. The newly matured aecidiospores collected in July gave 54 per cent. germination on being tested immediately. The germination was increased by keeping at a low temperature (5° to 13° C.) during 22 days, while that of spores kept at room temperature dropped to zero in the same period.

The interval between infection and the first opening of the aecidia of *G. juniperi-virginianae* on *Pyrus ioensis* var. *plena* was about 72 days, and that for *G. globosum* on *Crataegus mollis* about 81 days.

Juniperus virginiana seedlings were successfully inoculated with the aecidiospores of *G. juniperi-virginianae* from *P. ioensis* var. *plena*, the wide variation in the number of galls developing from identical inoculations suggesting that red cedar seedlings may vary in disease resistance. *J. scopulorum* is the only other teleuto host known in Iowa.

The percentage of apple leaves infected by *G. juniperi-virginianae* varied roughly with the percentage of diseased leaf area as measured by an infection chart [which is described and figured].

Judged by the latter percentage 20 varieties are classed as very susceptible, 25 as susceptible, 73 as resistant, 18 as very resistant, and 2 as apparently immune. Evidence was obtained suggesting that the period of susceptibility in leaves of susceptible varieties is longer than in those of resistant ones.

Artificial inoculations showed that Tolman and York Imperial apples were highly susceptible to a strain of *G. juniperi-virginianae* from Morgantown, West Virginia, but were resistant to other strains from Iowa, Kansas, and Wisconsin, indicating the existence of physiological specialization within the species. There was little evidence that trees of any one apple variety show different degrees of resistance in different localities. Observations on varieties of known parentage suggest that the factors for resistance are transmitted genetically. Of the species of *Pyrus* other than the apple tested, only *P. ioensis* proved susceptible, the others being either resistant or immune.

None of the varieties of apple or crab apple grown in Iowa appears to be susceptible to *G. globosum*.

STEVENS (N. E.). **Two Apple black rot fungi in the United States.** —*Mycologia*, xxv, 6, pp. 536–548, 1 map, 1933.

The writer discusses the evidence leading to the generally accepted conclusion that Berkeley's *Sphaeropsis malorum* and the *Sphaeropsis* commonly found in Oregon on apple and pear are identical with each other but not with Peck's species of the same name (transferred by Saccardo to *Phoma* as *P. malorum* (Berk.) Sacc.), which is prevalent in the eastern United States on apple and many other hosts.

The stromatic characters and pycnidial structure are very similar in the two fungi, but these features have been found to vary so greatly with the substratum that no importance can be attached to them for diagnostic purposes. The only constant difference between Berkeley's and Peck's species so far detected by the writer lies in the spore characters. The hyaline, non-septate (gradually turning light brown and becoming septate) pycnospores of *S. malorum* Berk. measure 9 to 13 by 22 to 33 μ, mostly 9·5 to 10 by 23 to 29 μ, and have a relatively thick, glassy wall similar to that observed in *Diplodia natalensis* [cf. *R.A.M.*, xii, p. 790]. The pycnospores of Peck's species, on the other hand, are somewhat irregular in shape, uniformly tan to brown, indiscriminately septate or non-septate, and measure 12 to 18 by 24 to 30 μ, mostly 12 to 13 by 25 to 27 μ. In view of the apparent constancy of these differences in spore characters, the writer is inclined to regard the two fungi under observation as at least specifically distinct.

To illustrate the omnivorous nature of the common eastern States apple black rot fungus (Peck's species) a list is given of 73 host genera on which it has been found, mostly in a quasi-saprophytic form. It has also been reported from southern Europe but not from the north-western United States. On the other hand, the apple fungus of the Pacific Coast (Berkeley's species) is very rare in the eastern United States but fairly common in western Europe.

The oldest names applied to Peck's species appear to be those

given by Schweinitz, only one of which, *Sphaeria obtusa* 1832, shows ascospores as detected by Cooke, who made the combination *Physalospora obtusa* in 1892. A comparison of Peck's species with Schweinitz's material convinced the writer that the former is identical with *P. obtusa* (Schw.) Cooke, by which name, therefore, the apple black rot fungus of the eastern United States should be known. A provisional list is given of 61 published and 5 unpublished synonyms of *P. obtusa*, of which 4, namely, *S. obtusa*, *Melanops quercum*, *P. cydoniae*, and *P. malorum* [ibid., iv, p. 636; v, p. 90; vi, p. 424] are based on the examination of type or authentic material of the perithecial as well as the pycnidial stages. The earliest known name for Berkeley's species (for which no perithecial stage is known) is *S. mutila* Fries 1823, transferred by Montagne in 1834 to the genus *Diplodia* as *D. mutila* (Fries) Mont. A comparative examination of Montagne's and Berkeley's material showed that *Sphaeropsis malorum* Berk. should be referred to *D. mutila* (Fries) Mont. A list of 13 published and 3 unpublished synonyms is given.

SALMON (E. S.) & WARE (W. M.). **The Plum rust on Apricot and Peach.**—*Gard. Chron.*, xciv, 2453, pp. 490–492, 3 figs., 1933.

The authors record, apparently for the first time in England, the occurrence of plum rust (*Puccinia pruni-spinosae*) [*R.A.M.*, xii, p. 751] on apricots in Sussex, Kent, and Devon, and on peaches and nectarines in the last-named county. It is believed that this form, which is probably a specialized one, may have been recently introduced from some other country. Notes on the characters and distribution of the fungus, which has long been well known on the plum in England, are given.

KUPREWICZ (V. F.). Виды **Thecopsora** на Вишне и Черемухе. [Species of *Thecopsora* on the Cherry and Bird-Cherry.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 405–409, 2 graphs, 1933. [German summary.]

Comparative studies of material collected from various regions of European Russia showed that the rust of cherry (*Prunus cerasus*) and of bird-cherry (*P. padus*) in these areas is caused by the same species of *Thecopsora*, which was identified as *T. padi* (= *T. areolata*) [*R.A.M.*, v, p. 197; xi, p. 340]. Teleutospores of this fungus do not appear to be produced on the cherry. In the Russian Far East, however, *P. cerasus* is attacked by another species, which was shown to be identical with *T. pseudo-cerasi* described by Hiratsuka from Japan [cf. ibid., vi, p. 756]. This differs from the former in the size of its uredospores, and it produces abundant teleutospores on the cherry.

ZELLER (S. M.). **Crinkle disease of Strawberry.**—*Oregon Agric. Exper. Stat. Bull.* 319, 14 pp., 4 figs., 1933.

Crinkle disease of strawberries [*R.A.M.*, xiii, p. 110] in the Pacific coast region of the United States has caused the gradual

degeneration there of the Marshall variety and is a serious factor in the propagation of Corvallis and Ettersburg 121. In addition to the varieties previously cited [ibid., xi, p. 792], Clarks Seedling is also affected, as are the wild field strawberry (*Fragaria cuneifolia*) and the beach strawberry (*F. chiloensis*), transmission from both of which to cultivated strawberries was effected. Crinkle, which reduces the yield by over 50 per cent., is a mosaic-like, systemic virus disease, characterized at first by yellowish, pin-point spots in the leaves, the latter then becoming crinkled and unevenly streaked and spotted with yellowish tissues. Clearing of the veins sometimes accompanies this stage and the crinkling is due to a resulting check to the growth of the vein tissue. The plants are less erect than normally, somewhat chlorotic, and stunted. In some varieties such as Ettersburg 121 and Clarks Seedling the symptoms are less pronounced, rarely more than leaf mottling. It spreads from the mother plant to the runners, which perpetuate it in the planting stock. During the first few months after planting the symptoms are usually masked.

Crinkle is readily transmitted and disseminated by the strawberry leaf aphis (*Myzus fragaefolii*), the primary symptoms appearing some 12 to 15 days after inoculation. Seed taken from crinkle plants gave over 150 healthy seedlings and no diseased ones.

The condition is most conveniently eliminated from planting stock through the selection of healthy plants in plantings a year or more old, runners from these being planted in an isolated propagation plot according to a plant-unit system.

Crinkle is considered to be allied to but probably distinct from the yellows (xanthosis) described by Plakidas in California [ibid., vii, p. 650] and the yellow edge of strawberries in England [ibid., xii, p. 519].

BRANAS (J.) & DULAC (J.). **Sur le mode d'action des bouillies cupriques. Rôle de la dessiccation.** [On the manner of action of cupric mixtures. The part played by desiccation.]—*Prog. Agric. et Vitic.*, c, 53, pp. 642–644, 1933.

When acid, neutral, and alkaline Bordeaux and Burgundy mixtures were left to evaporate outdoors in full sunshine in July and in sunshine and shade in October (desiccation requiring, respectively, 2 hours, 1 day, and 4 days) and a week later distilled water was poured on to the residues and the amount of copper that dissolved was determined, it was ascertained that some of the copper sulphate in the acid Burgundy mixture had remained unprecipitated. In the neutral Burgundy mixture the copper sulphate kept in solution by the carbon dioxide tended to become progressively less dissolved the more carbon dioxide was liberated. The solubility of the copper carbonate of soda in the alkaline Burgundy mixture was considerably reduced by rapid desiccation. In acid, neutral, and alkaline Bordeaux mixture the precipitation of the copper dissolved in the original liquid stage continued at the expense of the calcium carbonate. With rapid desiccation the excess lime in very alkaline Bordeaux mixture did not become completely carbonated, so that the mixture retained an alkalinity favourable to the maintenance of the solubility of the copper.

VAN POETEREN (N.). **Californische pap.** [Californian mixture.]—*Tijdschr. over Plantenziekten*, xxxix, 12, pp. 321–325, 1933.

In connexion with some general observations on the composition and application of lime-sulphur sprays against fruit diseases, the writer draws attention to the recent introduction into Holland of foreign brands with a higher specific gravity than was hitherto customary, involving much confusion with regard to the concentration of the fungicide in practical use. Dutch manufacturers are now beginning to put similar products on the market, and an examination of four samples with specific gravities of 29·7°, 31°, 30·2°, and 29·9° Beaumé, respectively, showed that a figure round about 30° may satisfactorily and economically be adopted as a standard of preparation.

MARTIN (H.). **Petroleum products as spray spreaders.**—*Journ. Soc. Chem. Ind.*, lii, 49, pp. 429T–432 T, 1933.

At the South Eastern Agricultural College, Wye, the writer investigated the adaptability of various petroleum products for incorporation as spreaders with insecticidal and fungicidal sprays. The products examined fall into the following groups. (1) Calcium γ-sulphonates isolated from the acid tar produced in the refinement of lubricating oils by neutralization with lime, filtration, and evaporation to dryness. In a crude form these sulphonates possess excellent spreading properties unaffected by mineral acids or by any spray material (e.g., lime-sulphur and Bordeaux mixture) in common use.

(2) Sodium β-sulphonates extracted from petroleum oils after acid refinement. The products investigated are known commercially as 'naphthenic sulpho-acids', 'sodium sulphonate A', 'soda acids', 'soda soaps', and 'sunoco' [*R.A.M.*, vii, p. 453]. This group is also characterized by eminently satisfactory spreading properties which are destroyed, however, by the addition of excess lime and copper sulphate, so that their range of utility is limited. The relative solubility of the sulphonic acids in water and of the alkali sulphonates in hydrocarbon oils suggests the superiority of this group over fatty acid or resin soaps in the preparation of miscible oils.

(3) The alkali naphthenates, derived from the alkali washings of crude petroleum oils, are good spreaders but, like the last mentioned, ineffective in the presence of excess lime or copper sulphate. The crude naphthenic acids, by reason of the phytocidal properties of the crude oil present, are unsuitable for the preparation of spray spreaders.

(4) Of the 'oxidized' petroleum derivatives, 'penetrol' has been recommended in the United States as an activator for nicotine [ibid., x, p. 225]. The active constituents of this preparation are alleged to be 90 per cent. oxidized petroleum hydrocarbons (32° to 40° B.) sulphonated. The other two products of this group, 'activol' and 'special spreader', resemble penetrol in character but are of British origin. All gave promising results, their spreading capacities being unimpaired by contact with copper sulphate or lime.

(5) The British pharmaceutical preparation 'ichthammol' consists of the ammonium salts of the sulphonic acids of an oily

substance, derived from a bituminous schist, together with ammonium sulphate and water. It is a blackish syrup yielding a solution in water of moderate spreading capacity, unaffected by calcium or copper compounds.

Symposium and discussion on the measurement of disease intensity.—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 174–186, 1 graph, 1933.

A summary is given of three papers that were read at a meeting in London in January, 1933, of phytopathologists of the British Mycological Society, in which methods were described for the measurement in the field of the intensity of potato blight [*Phytophthora infestans*] by A. Beaumont, of apple scab [*Venturia inaequalis*] by R. W. Marsh, and of net blotch (*Helminthosporium teres*) of barley by H. B. Bescoby. In a discussion which followed, W. B. Brierley pointed out that the phrase 'measurement of disease intensity' is rather ambiguous, as in the sense it is usually used, it comprises really two distinct conceptions, namely, 'extensity' which is largely a matter of distribution and rate of increase of the disease, and 'intensity' which is largely a measure of lethality or damage done to that portion or product for which the given crop is cultivated.

STEVENS (N. E.). **Some significant estimates of losses from plant diseases in the United States.**—*Phytopath.*, xxiii, 12, pp. 975–984, 6 graphs, 3 maps, 1933.

Most of the data summarized and discussed by the author in connexion with the estimation of losses from plant diseases in the United States have already been noticed in this *Review* from other sources [cf. *R.A.M.*, xiii, p. 176]. The diseases included in the present survey are wheat bunt [*Tilletia caries* and *T. foetens*: ibid., xi, p. 232], brown rot of peaches [*Sclerotinia americana*: ibid., xii, p. 378], sweet potato storage rots [*Rhizopus* spp., *Ceratostomella fimbriata*, and other organisms: ibid., iv, p. 699; v, p. 628, *et passim*], decay in forest products, and false blossom of cranberry [ibid., xii, p. 706].

Bundesanstalt für Pflanzenschutz (Landw. bakt. Versuchsanstalt) Mitteilungen 167 (2. Auflage), 216, 217, 221–223, 229, 230, 233, 234, 236. [Federal Institute for Plant Protection (Experimental Institute of Agricultural Bacteriology) Leaflets 167 (2nd Edition), 216, 217, 221–223, 229, 230, 233, 234, 236.] —20 pp., Vienna, 1933.

The leaflets enumerated in the title, issued by the Austrian Federal Institute for Plant Protection, deal with seed-grain disinfection (F. Pichler), 'glassiness' of apples due to physiological disturbances (R. Fischer), fruit tree carbolineum (O. Watzl), downy mildew of the vine (*Peronospora*) [*Plasmopara viticola*] (F. Hengl), club root of cabbage and other crucifers (*Plasmodiophora brassicae*) and its control, trellis rust of pears (*Gymnosporangium sabinae*) [*R.A.M.*, xi, p. 799], dying-off of apricots associated with adverse environmental conditions [cf. ibid., xii, p. 575], leaf spot of beet (*Cercospora beticola*) [ibid., xi, p. 19], bitter pit of apples [ibid., xiii, p. 169],

American gooseberry mildew (*Sphaerotheca mors-uvae*), and leaf curl of peaches (*Taphrina deformans*), all by R. Fischer.

PETERSEN (H. E.). **Wasting disease of Eelgrass (Zostera marina).** —*Nature*, cxxxii, 3348, p. 1004, 1933.

In a report by H. F. Lewis of the Department of the Interior, Canada, Miss E. S. Dowding is said to have detected 'a coarse mycelium' in one blackened portion of the rhizome cortex of one sample only of *Zostera marina* [*R.A.M.*, xiii, p. 115]. A branched, septate, dark brown mycelium is stated to be a constant feature of the black spots on eelgrass suffering from the wasting disease now widespread in Danish waters that the writer has examined. In the rhizomes the fungus mostly occupies the outer cortex; in the leaves it is found in the mesophyll cells. The organism (a Hyphomycete) was successfully isolated once only and found to be capable, when growing on agar blocks in sea water, of attacking *Zostera* leaves and producing dark spots. Conidia are produced in large numbers in sea water by the isolated mycelium, but only a few were observed in nature during the summer of 1933.

BUCHWALD (N. F.). **Om virussygdomme hos planterne.** [On the virus diseases of plants.]—*Naturens Verden, 1933*, pp. 447–470, 14 figs., 1933.

The history of research on the virus diseases of plants is concisely outlined and the various aspects of the problem now undergoing investigation are discussed. Notices of most of the recent work referred to have appeared from time to time in this *Review* [cf. *R.A.M.*, xiii, p. 116].

SORIANO (S.). **Nota sobre algunas enfermedades de los vegetales producidas por 'virus' en la República Argentina.** [A note on some plant diseases caused by 'viruses' in the Argentine Republic.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 87–90, 3 pl., 1932.

In addition to tobacco [*R.A.M.*, xi, p. 269], other well-known crops, and some weeds, the following plants are affected by viruses of the mosaic type in the Argentine Republic: *Isatis tinctoria*, lupins (*Lupinus albus* and *L. pilosus*), groundnuts, *Abutilon striatum* var. *thompsoni* [ibid., xi, p. 406], chilli (*Capsicum annuum*) [ibid., xii, pp. 354, 759], sunflower (*Helianthus annuus*), and *Pacourina edulis*. The writer found that lupins, on which observations have been carried out at the Buenos Aires Agricultural Experiment Station and in the surrounding country, are of first-rate importance in studies of interspecific transmissibility of mosaic and the insect vectors of infection.

ROEMER (T.). **Immunitätszüchtung. Eine zusammenfassende Darstellung 14jähriger Arbeiten aus dem Gebiete der Biologie (1920–1933).** [Breeding for immunity. A comprehensive survey of 14 years' studies in the biological field (1920–1933).]—*Flora*, N.F., xxviii (Karsten-Festschr.), pp. 145–196, 8 figs., 1 diag., 1933.

After an introduction explaining the economic and cultural

importance of plant breeding for freedom from fungous diseases, a very full account is given of the work carried out at the Halle Agricultural Institute for the past fourteen years in the breeding of wheat for resistance to smuts (*Tilletia tritici* [*T. caries*: *R.A.M.*, x, p. 717] and *Ustilago tritici* [ibid., ix, p. 708]) and rusts (*Puccinia glumarum* and *P. triticina*) [ibid., xi, p. 31]; barley to *U. nuda* [ibid., xi, p. 776] and *Helminthosporium gramineum* [ibid., x, p. 231]; oats to *U. avenae* [ibid., x, p. 652]; and beans (*Phaseolus nanus*) to *Colletotrichum lindemuthianum* [ibid., xi, p. 666].

The methods employed are described at some length and a summary is given of the more important results. In all cases immunity was found to be transmitted by independent Mendelian factors. It was frequently possible to obtain exact data for the mode of inheritance (dominant or recessive) of immunity and susceptibility, while in a few cases, where only one genetic factor was involved, a complete analysis of the reactions could be made. In other instances, however, even an approximate calculation was precluded by the existence of two or more genetic factors, as indicated by the segregation ratios in the F_2 or F_3 generations. The resistance of wheat to *T. caries* was found to be recessive polymerous, to *U. tritici* and *P. glumarum* (summer wheat) recessive monomerous, to *P. glumarum* (winter wheat) dominant mono- and polymerous, and to *P. triticina* dominant monomerous; of barley to *U. nuda* dominant monomerous and to *H. gramineum* dominant polymerous; of oats to *U. avenae* dominant mono-, di-, and trimerous, and of beans to *C. lindemuthianum* dominant trimerous.

An important outcome of the Halle breeding experiments was the detection of biologic races within the species of some of the fungi concerned in the above-mentioned diseases, most of the work on which has been noticed in this *Review*.

ARNAUDI (C.). **Ueber die Technik der künstlichen Immunisierung von Pflanzen.** [On the technique of the artificial immunization of plants.]—*Phytopath. Zeitschr.*, vi, 5, pp. 525–530, 1933.

A summary is given of the various methods employed by the writer and others for the immunization of plants against parasitic diseases. Most of the work referred to has already been noticed in this *Review* [cf. *R.A.M.*, xi, pp. 529, 798; xii, p. 779; and above, p. 276].

BUCHWALD (N. F.). **De nyeste forskningsresultater vedrørende den kønnede forplantning hos rustsvampene.** [The results of the latest researches on sexual reproduction in the rusts.]—*Nordisk Jordbrugsforskning, 1933*, 2, pp. 131–148, 6 figs., 1933.

Following a brief historical sketch of the history of sex investigation in the rusts, beginning with Meyen's work in 1841, the writer summarizes and discusses some of the more outstanding results of recent studies of the problem, notices of which have appeared from time to time in this *Review* [cf. *R.A.M.*, xii, p. 530].

ANDRUS (C. F.). **Sex and accessory cell fusions in the Uredineae.** —*Journ. Washington Acad. Sci.*, xxiii, 12, pp. 544–557, 3 figs., 1933.

Continuing his studies on the mechanism of sex in the bean [*Phaseolus vulgaris*] and cowpea rusts (*Uromyces appendiculatus* and *U. vignae*, respectively) [*R.A.M.*, x, p. 810], the writer describes in detail the fusion of the spermatia with superficial hyphae of the gametophyte and the passage of the spermatial nucleus down the multicellular trichogynous hyphae which remain haploid after the spermatium nucleus has passed through their cells. Fertilization is effected by the entry of the spermatial nucleus into certain 'egg cells' at the base of the aecidium. The fertilization process apparently does not cease with the entrance of a particular spermatium nucleus into a given egg cell, since this is followed by division of the egg nucleus and probably also of the spermatium nucleus, and by further migrations of both.

GALLOWAY (L. D.). **The stimulation by dilute antiseptics of 'sectoring' in mould colonies.**—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 161–162, 1 fig., 1933.

The author states that the majority of his cultures of *Aspergillus terreus* [*R.A.M.*, xi, p. 241] on flour agar were stimulated by the presence of 0·003 to 0·005 per cent. of the sodium salt of salicylanilide in the medium to produce sectors of a lighter colour than normal, and that after four subcultures on wort agar slopes the white and normal types still remained quite distinctive.

KÖHLER (E.). **Die Viruskrankheiten der Kartoffel.** [The virus diseases of the Potato.]—*Biol. Reichsanst. für Land- und Forstwirtsch. Flugbl.* 42, 4 pp., 5 figs., 1933.

Notes are given in popular terms on the occurrence, etiology, and control of leaf roll, mosaic, leaf curl, and streak of potatoes in relation to degeneration in Germany [*R.A.M.*, xii, p. 587; xiii, p. 119].

BÖHME (R. W.). **Vergleichende Untersuchungen mit Stämmen des 'X'- und 'Y'-Virus.** [Comparative studies on strains of the 'X' and 'Y' viruses.]—*Phytopath. Zeitschr.*, vi, 5, pp. 517–534, 1933.

Four X viruses are differentiated on the basis of the writer's observations on potatoes in Germany, viz., those originating in the Duke of York, Kuckuck, Gustav Adolf, and Erdgold varieties, the three first-named being of the 'mottle' or 'healthy' potato type [*R.A.M.*, xii, pp. 48, 581, 717, *et passim*], and the last partaking of the nature of 'etch' [ibid., xiii, p. 119]. Three distinct forms of the Y virus were further differentiated on the basis of their effects on various hosts, of which *Nicotiana sylvestris* and *Solanum aculeatissimum* showed the most characteristic symptoms. Natural and artificial mixtures of the two viruses, as well as X and Y in the pure state, were transmitted to a number of plants, including eight commercial tobacco, three chilli (*Capsicum annuum*), and two tomato varieties. The inoculated plants differed in the time of

onset and extent of the necrosis according to the identity of the infective agents. For instance, tomato and certain chilli varieties in particular failed to react to inoculation with the X-1 virus (Duke of York) by the development of streak, whereas the Gustav Adolf and Erdgold viruses (X-2 and X-4) caused severe necroses of the stems, petioles, and leaf pinnae with eventual defoliation, and the Kuckuck virus (X-3) produced similar but less pronounced effects. It was shown by inoculations with mixtures of the X and Y viruses that modifications in the symptoms or course of the resultant diseases may depend on variations in the virulence of the Y component. Apart from *N. glauca* and *N. palmeri* the species of *Nicotiana* used in the tests reacted in a very clear-cut manner to inoculation with the viruses. Eggplants are apparently immune from the strains used in these experiments, while *Nicandra physaloides* is resistant to some but susceptible to others. Within the species *Petunia violacea* and *P. nyctaginiflora* individual variations in reaction to the different X strains were observed. *Datura stramonium, D. inermis,* and *D. tatula* acted as 'filters' for all the Y strains tested, whereas *D. meteloides* reacted to inoculation with an X and Y mixture by symptoms recalling those of spot necrosis of tobacco.

Grafted on to President potatoes, all the X strains cause acronecrosis [ibid., xiii, p. 179] but X-1 and X-2, in contrast to X-4, are not transmissible by rubbing to Ackersegen, President, or Preussen. Deodara and Parnassia, on the other hand, contracted infection on inoculation with the X strains but showed no external symptoms. Full details are given of the manifestations induced in the various hosts by inoculation with the different X and Y strains. No differences were detected between the four X strains in respect of thermostability. On the other hand, strain 1 of the Y virus did not succumb to a temperature of 55° C. in the presence of an X strain, whereas strain 2 in the pure state failed to act on the test plants under these conditions.

FERNOW (K. H.). **A partially masked mosaic of Potatoes.**—*Amer. Potato Journ.*, x, 12, pp. 235–245, 1933.

The results [which are tabulated and discussed] of greenhouse indexing experiments on certified lots, or their progeny, of Smooth and Russet Rural potatoes from New York State indicated that at least a third and probably more of the tubers of these varieties are affected by a disease of the mosaic type not ordinarily detectable in field inspections [see preceding abstract]. Observations made on samples of New York potatoes planted in Bermuda in 1931–2 showed, however, that mosaic may be detected in both varieties in that island, the Smooth being apparently more susceptible than the Russets (average percentages of infection in 1931 18 and 8, and 1932 39 and 11, respectively).

Inoculation experiments by needle pricks, rubbing, and grafting showed that this masked form of mosaic is transmissible to Green Mountains and Bliss Triumphs, on which it produces marked but variable symptoms suggesting the participation of several viruses. The progeny of the inoculated plants were separated into

four distinct symptom groups as follows: (1) wrinkling but no curling and little distortion or streaking of the foliage; a few rather large, sharply outlined, pale areas on a leaf; (2) ruffling, curling, slight streaking, and distinct pale areas on the leaves; (3) wrinkling and curling more prominent than in the foregoing, pale areas less distinct, streaking; (4) marked curling and yellowing of the leaves, followed by defoliation, severe streaking of leaf veins, petioles, and stems, small, numerous, ill-defined pale areas.

The results of three years' observations on the effect of the disease on Rurals showed that a serious reduction in yield occurs even under conditions completely masking the symptoms. Such losses amount roughly to 30 bushels per acre, or 15 per cent. of the yield, and their prevention, chiefly by the use of carefully selected 'seed', is urged.

BARTON-WRIGHT (E.) & MCBAIN (A.). **Studies in the physiology of the virus diseases of the Potato. II. A comparison of the carbohydrate metabolism of normal with that of crinkle Potatoes; together with some observations on carbohydrate metabolism in a 'carrier' variety. III. A comparison of the nitrogen metabolism of normal with that of leaf-roll Potatoes.**—*Ann. of Appl. Biol.*, xx, 4, pp. 525–548; 549–589, 29 graphs, 1933.

Continuing their studies of the physiology of the virus diseases of the potato [*R.A.M.*, xii, p. 48], the authors state that the results of their controlled experiments, in which they compared the carbohydrate metabolism in virus-free Arran Victory and President plants and in those that were infected by grafting with crinkle (Arran Victory from Irish Chieftain) and paracrinkle (President from King Edward), showed that in the early stages of the disease there was no statistically significant difference between the formation of carbohydrates in the healthy and in the diseased plants, sucrose being found to be the translocatory sugar in both cases. Significant differences, however, were determined in the later part of the season, sucrose showing a marked tendency to accumulate in the diseased leaf blades, and being formed in them for the most part by direct hydrolysis of starch, whereas in the healthy laminae it was formed by synthesis from hexose derived by hydrolysis from starch; there also was evidence that the translocation of sucrose was not so easily effected down the diseased as down the healthy petioles. The presence of a latent virus in a potato variety was shown to produce no significant difference in carbohydrate formation, either at the beginning or at the end of the growing season.

Further experiments indicated that there is apparently no fundamental difference in the nitrogen metabolism of healthy and leaf-roll infected plants of the same two varieties as above, and that the formation of nitrogenous compounds proceeds along the same lines in the healthy and diseased plants. Evidence is adduced in favour of the views of Abderhalden regarding the synthesis of protein in the green plant and a theory is advanced to account for protein synthesis direct from nitrate nitrogen and not through an intermediary stage of amino-acids.

KÖCK (G.) & GREISENEGGER (K.). **Tätigkeitsbericht des Kartoffelfachausschusses über das Jahr 1933.** [Report on the work of the Committee of Potato Experts during the year 1933.]—*Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 6, pp. 121–126, 1933.

An account is given of the work performed in Austria by the State-subsidized Committee of Potato Experts during 1933, among the activities of which the following may be mentioned. Further experiments on wart [*Synchytrium endobioticum*] control, near Frohnleiten, Styria, by soil disinfection with ventilato sulphur, sodium bisulphite, and sodium thiosulphate [*R.A.M.*, v, p. 249; ix, p. 334; xii, p. 187] gave very encouraging results in respect of the first-named treatment, the others being only partially effective. Considerable attention was paid to breeding for immunity from wart disease, over 100 hybrids having been inoculated for testing purposes during the year. Of 41 varieties and strains tested for their reaction to *S. endobioticum*, 25 proved to be susceptible.

The increased yields resulting from the use of 1, 0·5, and 0·25 per cent. Bordeaux mixture against *Phytophthora infestans* [loc. cit.] ranged from 26 to 29 per cent. for the higher and from 8 to 13 per cent. for the lower concentrations. It is considered to be unnecessary to exceed a strength of 1 per cent.

FOLSOM (D.). **Botrytis cinerea as a cause of Potato tuber rot.**—*Phytopath.*, xxiii, 12, pp. 993–999, 2 figs., 1933.

In 1932 stored Green Mountain potato tubers in north-eastern Maine were found to be infected by *Botrytis cinerea*, which caused a rather soft, dark rot of the tissues accompanied by a flabbiness and wrinkling of the skin. Where the tissues were penetrated by the fungus, the eyes were filled with tufts of grey mould, sometimes in association with blue mould (*Penicillium* sp.). Inoculation experiments with *B. cinerea* from decayed material produced the typical symptoms of the storage rot, as well as a more shallow, arrested type of lesion with a predominantly pinkish-buff surface. The deeper, more actively penetrating rot was found to be favoured by low temperature (5° C.) and a saturated atmosphere. No consistent differences in infective capacity were observed between cultures originating from tubers in 1927 and 1932, from leaves and stems in 1931, or monospore and monohyphal subcultures. Mycelial cultures were more virulent than spores, and tuber infection by *B. cinerea* is believed to be a sequel to stem and leaf blight, the internal mycelium passing from the stems to the tubers through the stolons.

TULLIS (E. C.). **Leptosphaeria salvinii, the ascigerous stage of Helminthosporium sigmoideum and Sclerotium oryzae.**—*Journ. Agric. Res.*, xlvii, 9, pp. 675–687, 6 figs., 1933.

This is a full report of the author's studies, in which he established the genetic connexion between the sclerotial (*Sclerotium oryzae*), conidial (*Helminthosporium sigmoideum*), and ascigerous stages of the rice parasite *Leptosphaeria salvinii* Catt. [*R.A.M.*, xii, p. 392], a technical description of which is appended. The perithecia are dark, globose, 202 to 481 μ, with a rather short beak.

The asci are narrowly clavate, short-stalked, and 90 to 128 by 12 to 14 μ in diameter. The ascospores are biseriate, normally eight (rarely four), 3-septate, usually somewhat constricted at the septa, brown, the two terminal cells usually of a lighter colour, fusiform, somewhat curved, and 38 to 53 by 7 to 8 μ. The ascigerous stage has been found on seven commercial varieties in Arkansas, Louisiana, and Texas, on a rice selection in Arkansas and Louisiana, and was described by Cattaneo on commercial rice in Italy. Viable ascospores have been found on old rice stubble as late in the winter as January, but it was not determined whether they live through the winter to cause fresh infections in the spring. The sclerotial and conidial stages also occur on *Zizaniopsis miliacea*, and were produced in cultures from rice obtained from Japan and India.

NISIKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Zur Kenntnis der physiologischen Differenzierung der Fusariumarten. II. Entwicklung verschiedener Stämme des Bakanaepilzes und Temperatur.** [Contribution to the knowledge of the physiological differentiation of *Fusarium* species. II. The development of various strains of the 'bakanae' fungus and temperature.]—*Landw. Studien*, xx, pp. 346–375, 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 4, p. (110), 1933.]

The optimum temperature for mycelial growth in various strains of the 'bakanae' fungus [of rice, *Gibberella fujikuroi*: *R.A.M.*, xiii, p. 263] was found to be 27° C., while that for *Fusarium moniliforme* [*G. moniliformis*] and its var. *majus* [ibid., xii, p. 719 and above, p. 300] is somewhat higher (29°). One strain of *G. fujikuroi* even proved to be capable of profuse development at 35°, but for the majority the maximum lies between 31° and 36° and the minimum at 7° to 8°. The outline of the colonies is circular, generally very sharply defined at higher temperatures and blurred at low ones. Many strains of the 'bakanae' fungus produce a red or purple coloration of cooked rice, while one (possibly belonging to a different species) turns it yellow.

SHIMADA (S.). **Change of pathogenicity shown by the 'bakanae' fungus, Gibberella fujikuroi.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, pp. 6–8, 1933. (Japanese summary.) [Abs. in *Japanese Journ. of Botany*, vi, 4, p. (113), 1933.]

After protracted cultivation in artificial media, *Gibberella fujikuroi*, the agent of 'bakanae' disease of rice [see preceding abstract] was found to have lost the capacity of inducing overelongation in the host plant, the accelerative substances responsible for which were absent from the filtrates of the nutrient solutions.

SJOLLEMA (B.). **Kupfermangel als Ursache von Krankheiten bei Pflanzen und Tieren.** [Copper deficiency as a cause of diseases in plants and animals.]—*Biochem. Zeitschr.*, cclxvii, 1–3, pp. 151–156, 1933.

Attention is drawn to the simultaneous occurrence, in the marshy regions of Holland, Germany, and elsewhere, of the so-called 'licking' of stock and 'reclamation disease' of plants. The writer's

investigations in Holland showed that the hay used as fodder for the affected animals was noticeably deficient in copper, and in general the symptoms were alleviated by the administration of copper sulphate.

In connexion with the reclamation disease of cereals it was ascertained that the copper content of winter wheat (whole ears) on sick soils was only 1·5 mg. per kg., compared with 3 and 4·5 mg., respectively, in plants treated with 60 or 120 kg. copper sulphate per hect. Rye seed in sick soil contained barely a trace of copper, while that in another part of the same field manured with compost had a copper content of 2 mg. per kg. Diseased oat straw contained 4 mg. copper per kg., while double the quantity was found in plants from the copper sulphate-treated portion of the field. These data indicate that the copper sulphate treatment raises the low copper content of the plants [*R.A.M.*, xiii, p. 57]. Smith in his investigations on the etiology of reclamation disease [ibid., vii, p. 269] failed to detect any copper in compost and concluded that the condition, which is readily combated by applications of copper sulphate (50 to 80 kg. per hect.) [ibid., vii, p. 396; x, p. 704], did not arise from copper deficiency. In three samples of compost analysed by the writer and his collaborators, however, 200 to 500 mg. copper per. kg. was found, and it is estimated that the application of compost at the normal rates of 50,000 to 80,000 kg. per hect. introduces as much copper into the soil as 60 to 130 kg. copper sulphate. The iron content of the compost was also exceptionally high.

BELL (A. F.). **Division of Pathology.**—*Thirty-third Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 54–61, 1933.

During the period under review varietal resistance trials in Queensland showed that the higher-numbered P.O.J. sugar-canes of the Kassoer blood line are generally highly susceptible to red stripe [*Phytomonas rubrilineans*: *R.A.M.*, xii, p. 245], downy mildew [*Sclerospora sacchari*], and Fiji disease, so much so that they introduce an entirely new degree of susceptibility, but that they are very resistant to gumming disease [*Bacterium vascularum*] and mosaic [ibid., xii, p. 787].

The variety chiefly affected by chlorotic streak [see next abstract] is Badila. A rapid survey indicated that prevalence is greatest in the rainiest parts of north Queensland, especially in low-lying areas. Attempts to transmit the disease by knife infection failed. As secondary transmission in the field is not, apparently, rapid control through the use of healthy planting material will probably be effective.

Dwarf disease [ibid., xii, p. 245] was reported from eight more properties in the Homebush area, while a further cane variety, Malagache, has now been found to be susceptible. Attempts to transmit the disease by means of *Aleurodes berghi*, *Aphis sacchari*, and *Perkinsiella saccharicida* failed. Secondary spread appears to be restricted to a particular type of country.

Breeding tests for resistance to *Bact. vascularum* are in progress, but only one cross (P.O.J. 2940 × S.C. 12/4) has shown sufficient resistance to warrant further trial.

Evidence obtained with Badila canes (plant and ratoon) during a period of five years strongly suggested that the final loss of yield due to *P. rubrilineans* is practically negligible. In one district early planting resulted in a very marked degree of control, one field planted in August having 39 per cent. dead stalks while another in proximity to it, planted in April, had only 2·5 per cent. In a varietal resistance trial at the South Johnstone Experiment Station H.Q. 426, S.J.4D, Badila, P.O.J. 2940, and P.O.J. 2878 showed, respectively, 0, 0, 10, 20·7, and 21·5 per cent. dead stalks.

A root disease of the *Marasmius* type was observed in different parts of Queensland, particularly in the Bundaberg district. Dark red spots, which sometimes coalesced, appeared on the leaves and were equally visible on both sides; they were more common on older than on younger leaves, sometimes killing the leaf. Stalks bearing affected leaves almost always showed on dissection a dry, brownish-red rot at the base and considerable root rot; diseased and healthy shoots were frequently present in one and the same stool.

BELL (A. F.). **A new disease of Cane in North Queensland.**—*Queensland Agric. Journ.*, xl, 6, pp. 460–464, 3 figs., 1933.

When cuttings of Badila sugar-canes infected with pseudo-scald (now identified with the Javanese 'fourth disease' and Hawaiian chlorotic streak) [*R.A.M.*, ix, p. 271; xii, pp. 245, 554] were subjected to hot water treatment (20 minutes at 52° C.) the treated canes remained completely free from the disease (though 14 out of 16 untreated stools developed the symptoms of the condition), were much higher than the immediately adjacent untreated canes, averaged 5 stalks per stool as against 3 for the untreated canes, and also gave a noticeably larger yield.

In Badila the leaf symptoms consist of cream to white longitudinal streaks in the leaf blade, from $\frac{1}{16}$ to $\frac{3}{16}$ in. wide, running parallel to the veins, and sometimes extending the whole length of the leaf, but usually less than 1 ft. long, and often fragmented. In older streaks the tissue frequently dies and becomes ashy-grey, with a narrow, reddish border. Such dead areas are small at first but may subsequently extend along nearly the whole length of the streak. In contrast with the sharply defined, uniform streaks produced by true leaf scald [*Bacterium albilineans*], the streaks due to pseudo-scald are wavy and of varying width; pseudo-scald streaks do not pass down to the leaf sheath as do the streaks caused by true scald, which, moreover, are seldom fragmented. If the stalks of plants affected with pseudo-scald are cut open a very few reddened fibres may be found.

Pseudo-scald symptoms are most pronounced in Badila canes when the young crops are just beginning to form canes (October–November in Queensland). As the cane grows higher the leaf markings often disappear, with the result that by the following March it may be impossible to find a single streak in a field nearly 100 per cent. diseased.

The wide distribution of pseudo-scald indicates that it has long been present in Australia.

LEBEDEVA (Mme L. A.). Грибы и миксомицеты Советской Карелии [Fungi and Myxomycetes of Soviet Karelia.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 329–403, 1933. [German summary.]

This is a systematically arranged and annotated list of 447 species of Myxomycetes and fungi, parasites and saprophytes, which were collected during the scientific expedition in 1920 to 1922, inclusive, to Russian Karelia, [a district a little to the north of Leningrad]. Morphological details are given of the less common organisms, and one genus and five species are fully described as new to science, Latin diagnoses being appended.

KERN (F. D.), THURSTON (H. W.), & WHETZEL (H. H.). **Annotated index of the rusts of Colombia.**—*Mycologia*, xxv, 6, pp. 448–503, 1933.

Critical and taxonomic notes are given on 215 species of Colombian rusts, 102 of which belong to *Puccinia*, 32 to *Uromyces*, 37 to unattached forms of *Aecidium* and *Uredo*, and the remainder to miscellaneous genera. The list includes five new species [with Latin diagnoses] and two new combinations. A complete index of 331 hosts and a selected bibliography are appended.

KERN (F. D.). **The microcyclic species of Puccinia on Solanum.**—*Mycologia*, xxv, 6, pp. 435–441, 1 pl., 1933.

A further critical examination has been made of the nine microcyclic species of *Puccinia* occurring on *Solanum* in Colombia, of which only *P. pittieriana* is recorded on potato [*R.A.M.*, x, p. 340; xi, pp. 226, 672]. Notes are given on the geographical distribution, host range, and synonymy of the species.

WILTSHIRE (S. P.). **The foundation species of Alternaria and Macrosporium.**—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 135–160, 3 pl., 6 figs., 1933.

This is a detailed and fully illustrated account of the author's re-examination of the foundation species of *Alternaria* and *Macrosporium* in an attempt to clear up the existing confusion in the taxonomy of these two genera. He traces the various conceptions of *A. tenuis* since Nees, who founded the genus on this single species in 1817, and concludes that the conception of this species now prevailing does not agree with that of Nees, although the characters of the genus have been correctly interpreted. He also traces the important points in the history of the genus *Macrosporium* from its foundation by Fries in 1832 on the four species *M. convallariae*, *M. tenuissimum*, *M. cheiranthi*, and *M. caricinum*. There does not exist any material which would permit of a definite identification of the first-named species, but what appears to be authentic material shows that the second is a recognizable species which the writer considers should be referred to *Alternaria* as *A. tenuissima* n. comb. The type of *M. cheiranthi* is available from Libert's exsiccatum, and this fungus was collected by the author on wallflowers (*Cheiranthus cheiri*) in England in 1930; it is regarded as a good and recognizable species, only the records on

this host agreeing with the type. The fourth species, *M. caricinum*, is a *Clasterosporium* identical with *C. caricinum* Schweinitz.

The study of various species referred to these two genera, *Alternaria* and *Macrosporium*, shows that they include three types of fungi, namely: (*a*) those forming long chains of shortly or comparatively shortly beaked spores, such as *A. citri*, *A. longipes*, *A. tenuis* auct., &c., all of which are clearly congeneric with *A. tenuis* Nees, and are placed in the genus *Alternaria* by common consent; (*b*) those forming chains only rarely, the spores being provided with long, filiform beaks, e.g., *A. macrospora*, *A. tomato*, *A. solani*, *M. ricini*, *M. sesami*, &c.; these are sometimes placed in *Alternaria* and sometimes in *Macrosporium*; and (*c*) those with spores normally borne singly (though occasionally bearing secondary ones on short conidiophores), sarcinaeform, without any beak, usually with a major cross-wall accompanied by a constriction, e.g., *M. sarcinula*, *M. parasiticum*, *M. eriobotryae*, and the like, all of this type being commonly referred to *Macrosporium*. This last forms a homogeneous group, sharply defined from the other two which grade into one another.

Of the five foundation species discussed above, only three need be considered, namely, *A. tenuis*, *M. tenuissimum*, and *M. cheiranthi*, and as these belong to groups (*a*) and (*b*), they can best be considered as representing a single genus. The author gives reasons for preferring the generic name *Alternaria*, *Macrosporium* being placed in the list of *nomina ambigua*. *A. tenuis* is considered to be the type of the genus, and *A. tenuissima* and *A. cheiranthi* the Friesian representatives. The name *Macrosporium* being already used, its type being an *Alternaria*, the forms in group (*c*) must find another name, *Thyrospora* [*R.A.M.*, v, p. 233] becoming the valid genus for these forms.

MARCHIONATTO (J. B.). **Notas sobre algunos 'Sclerotium' parasitos de las plantas economicas.** [Notes on some species of *Sclerotium* parasitic on economic plants.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 39, pp. 301–305, 4 figs., 1933.

Since 1929 *Sclerotium rolfsii* has been observed in the Argentine attacking carnations, dahlias, groundnuts [*R.A.M.*, xi, pp. 431, 621, 699], *Solidago microglossa*, and potato [ibid., xi, pp. 547, 748]. *Sclerotium cepivorum* has been recognized since 1913 on onions, garlic, and many other kitchen-garden plants [ibid., xi, p. 219]. A species of *Sclerotium* allied to *S. cepivorum* was isolated by J. C. Lindquist from chilli fruits, and another resembling *S.* [*Sclerotinia*] *sclerotiorum* from the roots of *Carthamus tinctorius*.

LEACH (R.) & SMEE (C.). **Gnarled stem canker of Tea caused by the Capsid bug (Helopeltis bergrothi Reut.).**—*Ann. of Appl. Biol.*, xx, 4, pp. 691–706, 2 pl., 1933.

This is an expanded account of the authors' investigation of the tea canker caused by the insect *Helopeltis bergrothi* in Nyasaland, a preliminary report of which has already been noticed [*R.A.M.*, xii, p. 332; xiii, p. 232].

JOCHEMS (S. C. J.). **Ziekten der Tabak.** [Tobacco diseases.]—*ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1933.** [Survey of the diseases and pests of Deli Tobacco in the year 1933.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. ii, lxxxviii, pp. 3–16, 1 map, 1933.

Stem scorch (*Pythium* spp.) was reported from 43 tobacco plantations in Sumatra [*R.A.M.*, xii, p. 471], mostly in a sporadic form but in some cases showing an incidence of up to 80 per cent. In six plantations it was observed that the disease was most prevalent in areas previously planted with *Leucaena glauca*, while in another a connexion was traced between the presence of *Phytolacca octandra* and the occurrence of *Pythium* in the tobacco.

Leaf scorch (*Cercospora nicotianae*) [ibid., xii, p. 333] occurred in some plantations in the field and in others in the curing barns; only one plantation reported a serious attack of both forms.

Notes are given on the intensity of various other tobacco diseases, including several of the virus type. Four of the five plantations affected by 'daon lidah' [ibid., xii, p. 471] are situated on alluvial soils while the fifth is on residuary liparite. As usual, the disease extended over several groups of fields, some of which were affected to the extent of 80 per cent. Ordinary mosaic ('peh sim') is more influenced by soil types than any of the others, being practically absent from residual soils and prevalent on alluvial ones. A map is given to bring out this relationship in the Medan district. Rotterdam B disease [loc. cit.] shows a somewhat similar distribution.

DUGGAR (B. M.) & JOHNSON (B.). **Stomatal infection with the virus of typical Tobacco mosaic.**—*Phytopath.*, xxiii, 12, pp. 934–948, 1 graph, 1933.

In order to test the possibility of the stomatal infection of tobacco leaves by the typical mosaic virus, natural infective juice was diluted to one-tenth in distilled water, then celite-treated [*R.A.M.*, xii, p. 648], and applied to the surfaces with a De Vilbiss No. 15 atomizer. Data on humidity and temperature were then taken, and strips of the epidermis removed from each of two control plants to ascertain the size of the stomatal apertures. The sprayings were made in a subdued light, and at varying intervals on batches of 10 plants throughout a continuous period of 24 hours.

The percentage of infection resulting from this method of inoculation was found to range from 30 to 90, with an average of 70, or considerably higher than was suggested by previous experiments (unpublished data) with full-strength infectious juice passed through a porous porcelain filter. No correlation could be established between the time of day or environmental conditions and the percentage of mosaic. Some indication was given of a connexion between the size of the stomatal apertures and the incidence of infection, but the evidence on this point is not entirely conclusive. No increase of infection (as compared with that induced by the spraying method) was secured by dropping a virus suspension on leaf areas in which the epidermal hairs had been severely damaged by rubbing. A lower percentage of infection, on the other hand, resulted from the placing of large drops of the suspension on

unwounded leaves. The very low incidence of mosaic following the immersion of individual healthy leaves attached to the plants for varying periods in virus suspensions is tentatively attributed to surface tension factors or possibly the stomata are blocked by air bubbles. Infection with the atomizer may be due either to the 'shooting' of particles of the virus suspension into fully open stomata, or more probably to the spreading films formed as the spray particles impinge on the stomatal walls.

BARTON-WRIGHT (E.) & MCBAIN (A. M.). **Possible chemical nature of Tobacco mosaic virus.**—*Nature*, cxxxii, 3348, pp. 1003–1004, 1933.

Johnson's No. 1 tobacco mosaic [*R.A.M.*, xiii, pp. 188, 192], received from the Cheshunt Research Station, proved to be transferable by juice inoculation to *Nicotiana macrophylla*. An examination was made of the mixed phosphate eleuate described by Vinson and Petre [ibid., x, p. 761]. This was found to contain protein and to be highly infectious to all the ten plants inoculated. Protein was further detected in the heavy white precipitate resulting (contrary to Vinson's and Petre's observations) from the addition of acetone to the eleuate, which was also infectious to all the five plants inoculated. The acetone precipitate was found to be separable into two fractions, a white crystalline solid and a gelatinous substance that proved to be protein. Inoculation with the latter alone induced mosaic in all five inoculated plants. On purification, washing with ether, and desiccation, the white crystalline solid was found to consist mainly of phosphate with a considerable admixture of organic matter but no nitrogen; it also was infectious to all five plants inoculated in the first series of tests and to all eight used in the second. That the protein fraction is not necessary for mosaic infection was further shown by the following test. The addition of 1 per cent. safranin to the phosphate eleuate produced a slow precipitate, which was separated on the centrifuge, suspended in water, and the safranin removed with normal amyl alcohol. The aqueous solution, containing neither protein, phosphate, nor nitrogen, was shown to be infectious.

For control purposes, sap from healthy plants was treated as described above, but in this case the addition of acetone to the mixed phosphate eleuate merely resulted in a faint opalescence which did not settle for many hours.

The isolation of a white crystalline compound containing no nitrogen and yet highly infectious is considered by the writers to preclude the 'living entity' theory [ibid., xiii, p. 116] of the tobacco mosaic virus. In its precipitation with safranin it shows affinities with the proteolytic enzymes, but further investigations are necessary to determine its exact nature.

JENSEN (J. H.). **Isolation of yellow-mosaic viruses from plants infected with Tobacco mosaic.**—*Phytopath.*, xxiii, 12, pp. 964–974, 2 figs., 1933.

Small, bright yellow spots, containing the yellow mosaic virus [*R.A.M.*, xi, pp. 735, 750], occasionally developed on Turkish tobacco, *Nicotiana sylvestris*, and tomato leaves infected with

ordinary tobacco mosaic, whether naturally or as a result of inoculation.

Three groups among 26 isolations made from these yellow spots produced markedly divergent symptoms on various species of *Nicotiana*, tomato, *Physalis angulata*, and Hangchow Long egg-plants. The viruses of group (1) caused general systemic infection with symptoms resembling those of tobacco mosaic but characterized by more intense yellowing. Vein clearing was a consistent feature of this group and was succeeded by the emergence, first of several mottled, distorted leaves and then of three or four intensely green ones which gradually developed large chlorotic areas. In some cases the foliar tissue was so severely injured that complete collapse and necrosis ensued. The first symptoms of systemic infection by the group (2) viruses consist of numerous small, yellow lesions on one or two of the young leaves. In some cases the spots tended to coalesce and form a rough vein-clearing pattern, while in others they slowly expanded to cover most of the leaf. On the higher leaves blotches or ring-like lesions appeared and slowly enlarged. Group (3) was represented by a number of isolations producing few or no symptoms besides the primary yellow lesions on the inoculated leaf. Sometimes one or two leaves above the inoculated one showed isolated yellow spots, while others bore chlorotic oak-leaf patterns. The viruses of group (1) are readily transmissible to healthy plants, whereas those of (2) and (3) are only communicable with great difficulty. They reproduced their characteristic symptoms on further transmission.

The evidence obtained in the course of these studies indicates that the yellow mosaic viruses originate during the multiplication of the tobacco mosaic virus in infected plants. Since some are transmissible with difficulty it is improbable that they would be carried over as admixtures with the ordinary mosaic, and attempts to isolate the latter free from them failed.

BÖHME (R. W.). **Einige Fälle spontaner Infektion mit echtem Tabak-Ringflecken-Virus (Tobacco-ringspot).** [Some cases of spontaneous infection with the true Tobacco ring spot virus (Tobacco ring spot).]—*Phytopath. Zeitschr.*, vi, 5, pp. 507–515, 9 figs., 1933.

Attention is drawn to the spontaneous development of a virus apparently identical with true ring spot [*R.A.M.*, xiii, p. 131] on isolated plants of pure lines of the Samsun and Baffra tobacco varieties from the Forchheim Tobacco Research Institute. In a comparative test with German and American plantings of Samsun, four out of 120 of the former showed symptoms indicative of ring spot, which did not appear in any of the 80 of the latter. A similar phenomenon was observed on the Turkish Xanthia and a Virginian tobacco. Mechanical transmission experiments with the expressed juice gave positive results on *Petunia violacea*, *Datura stramonium*, and Paul Krüger [President] potatoes (local symptoms only on the last-named), but failed on *Capsicum annuum* and tomatoes. On Ackersegen potatoes the ring spot virus appeared spontaneously in the field in the form of an aucuba mosaic-like yellowing and was successfully transmitted to *D. tatula*, *P. viola-*

cea, and *Nicandra physaloides*. It is pointed out that insect transmission of this disease has apparently not been recorded.

HOGGAN (ISMÉ A.). **Some factors involved in aphid transmission of the Cucumber-mosaic virus to Tobacco.**—*Journ. Agric. Res.*, xlvii, 9, pp. 689–704, 1 fig., 1933.

The results of experiments reported in detail in this paper showed that single individuals of the green peach aphid (*Myzus persicae*) were only occasionally able to transmit cucumber mosaic [*R.A.M.*, xii, p. 673] to tobacco, the percentage of infection increasing with the number of insects used. No differences were observed in the relative efficacy of the various stages of the aphid in transmitting the virus, and the adults were shown to become infective after feeding in the adult stage alone on the diseased host. The entire process of picking up the virus and transmitting it to a healthy tobacco plant required a very short time, usually under 30 minutes, there apparently being no incubation period of the virus inside the insects. Viruliferous aphids lost their infectivity after feeding for two hours on a healthy plant or after starvation for 18 to 27 hours, but were still infective after having been starved for two to three hours. There was no evidence that the virus is transmitted by infective aphid parents to their progeny.

The results of the investigation would indicate the purely mechanical nature of the transmission of the cucumber mosaic virus by *M. persicae*. It is believed that the selective action of this aphid in picking up the cucumber mosaic virus alone from a combination of this virus with that of true tobacco mosaic may be due to the failure on the part of the aphid to extract the tobacco mosaic virus from the diseased host tissues.

Transference of infective aphids from diseased to healthy plants by means of a camel's-hair brush gave much less reliable results than when the insects were transferred on pieces of diseased leaves and allowed to migrate naturally to the new host.

HILL (A. V.) & ANGELL (H. R.). **Downy mildew (blue mould) of Tobacco. I. The influence of over-wintered plants, II. Wild hosts, and III. Spraying.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 260–268, 1 map, 1 pl. [opp. p. 308], 1933.

After referring to the prevalence of blue mould of tobacco [*Peronospora tabacina*: see above, p. 276] in New South Wales and Victoria during the autumn of 1932, the authors state that mycelium was found to be present at that time in the leaves, stems, and roots. The aerial portions of the plants were killed by frosts during the following winter, but the dormant underground buds began to grow in the spring (September), and mycelium was found in the young shoots. In October other shoots on the same plants showed characteristic infection, and it was evident that *P. tabacina* had survived the winter in the mycelial condition, the disease on the new spring growth arising from internal not external sources [cf. ibid., xii, p. 209]. The production of conidia on overwintered plants in the field has been repeatedly observed by the authors during the past four years.

Nicotiana glauca and *N. suaveolens*, besides being poisonous to

animals, are also hosts of *P. tabacina*. Owing to its resistance to drought *N. glauca* was formerly used for hedges and ornamental purposes in Australian gardens, but it escaped from cultivation and is now found in many localities, though both it and *N. suaveolens* tend to be restricted to districts with an average rainfall of not over 25 in. At Deniliquin in the south of New South Wales and at Cobram in the Murray Valley *N. glauca* was severely attacked by *P. tabacina*, some of the young shoots being killed; conidia were found on the affected leaves, and tobacco seed-beds in the vicinity were seriously attacked. *N. glauca* being perennial, the mycelium persists from year to year in the stems, whence it grows into the leaves and produces conidia which can infect the tobacco seed-beds.

When the disease was epidemic in neighbouring seed-beds spraying tobacco seedlings with Bordeaux mixture (2–2–40) at five-day intervals did not prevent the occurrence and spread of blue mould, as it was found impracticable to reach all parts, especially the under surface of the lower leaves. The earliest attacks were in the beds nearest to diseased overwintered plants. Infection did not occur early in isolated seed-beds, nor was it destructive where the plants were grown under relatively dry conditions.

The use of clean seed and the eradication of diseased overwintering plants would materially assist in the production of healthy seedlings, and by delaying any attack that might materialize would reduce the risk of serious loss. Seed-bed sites should be well drained, sunny, and if possible on a slope.

MANDELSON (L. F.). **Additional recommendations for the control of blue mould of Tobacco.**—*Queensland Agric. Journ.*, xl, 6, pp. 465–469, 2 figs., 1933.

After briefly summarizing improved methods of field sanitation for the control of blue mould of tobacco [*Peronospora tabacina*: see preceding abstract] the author states that from the time when they show above ground the seedlings should be sprayed every four days (with additional applications when they are growing rapidly and after heavy storms) with home-made colloidal copper, using soft soap as a spreader, or with copper emulsion, details of the preparation and correct application of which are given.

MANDELSON (L. F.). **Fungicidal experiments for the control of blue mould of Tobacco.**—*Queensland Agric. Journ.*, xl, 6, pp. 470–494, 3 figs., 1933.

In this paper the author gives details of the experiments on which he bases his recommendations [see preceding abstract] for the control of blue mould of tobacco (*Peronospora tabacina*). The results of the tests made with numerous fungicides are tabulated, the degree of control obtained being noted in each case, with brief observations. Even under conditions so conducive to infection that the controls were destroyed, a copper emulsion containing 3·1 per cent. soft soap and 0·47 per cent. copper sulphate applied first 13 days after germination, then weekly for three weeks, and thereafter twice weekly gave such good control that the beds became overcrowded from the dense stand of seedlings.

STEVENS (N. E.). **United States of America: further distribution of Tobacco downy mildew in 1932.**—*Internat. Bull. of Plant Protect.*, vii, 12, pp. 268–269, 1933.

During 1933 downy mildew of tobacco (*Peronospora hyoscyami*) was very prevalent in North and South Carolina and Georgia [*R.A.M.*, xii, p. 732], while its range was more extensive than in any previous year. Infection was again found as far north as Lancaster County, Pennsylvania, and was widely distributed in south-western Virginia and eastern Tennessee.

VAN BEYMA THOE KINGMA (F. H.). **Beschreibung einiger neuer Pilzarten aus dem Centraalbureau voor Schimmelcultures II.—Baarn (Holland.)** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures, Baarn (Holland) II.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 8–12, pp. 236–243, 6 figs., 1933.

Morphological and cultural details are given of five new species of fungi identified by the writer at the Centraalbureau voor Schimmelcultures [cf. *R.A.M.*, xii, p. 634]. *Cephalosporium tabacinum* n. sp. was received from Bristol and stated to have been isolated from the tissues of a diseased tobacco plant. It is characterized by a colourless growth of fasciculate, indistinctly septate, radiating hyphae, 1·3 to 2·7 μ broad, non-septate conidiophores of irregular shape, 16 to 36 by 2 to 3·3 μ, and hyaline, ellipsoidal to subglobular, biguttulate conidia, 4 to 8 by 2·7 to 3·7 μ (mostly 5·3 by 3·3 μ), uniting under moist conditions into heads 10 to 15 μ in diameter.

HOLMES SMITH (E.). **Spotted wilt disease of Tomatoes.**—*Gard. Chron.*, xciv, 2445, p. 350, 3 figs. (2 on p. 351), 1933.

An account is given of an outbreak of spotted wilt in a tomato house near Manchester [*R.A.M.*, xii, p. 541] in 1933, the characteristic metallic bronzing, chlorosis, and necrosis of the foliage having been noticed two to three weeks after the plants were brought into the house from another nursery. The fruit on affected plants, which were stunted, was marked by a yellow bull's-eye mottling, confined to the older ripening fruits on the trusses. Dahlia leaves in the same greenhouse, on which *Thrips tabaci* were particularly numerous, showed a series of pale halo spots surrounded by concentric dark brown rings [ibid., xiii, p. 133], while those of nasturtium (*Tropaeolum*) [*majus*] were mottled yellow with scattered dark brown, ringed spots or punctures, and antirrhinums were also affected, the chlorotic leaves showing a uniform circular spotting. Suggestions for the control of the vector, *T. tabaci*, by frequent applications of calcium cyanide, or dusting the foliage with grade 16 naphthalene at the rate of 10 oz. per 1,000 cu. ft. of glass are given.

Ninth Annual Report of the Imperial Forestry Institute, University of Oxford, 1932–33.—29 pp., 1933.

The following items of phytopathological interest occur in this report (pp. 14–16). Sweet chestnut [*Castanea sativa*] trees in Herefordshire were again attacked by *Phytophthora cambivora*,

the agent of ink disease [*R.A.M.*, xii, p. 334]. Inoculation experiments with the fungus on the reputedly resistant Japanese chestnut (*C. crenata*) [ibid., xiii, p. 63] gave positive results.

Studies on poplar canker have shown that an unexpectedly large number of species are liable to this disease, including *Populus generosa* and *P. eugenei* [ibid., xiii, p. 150].

The 'watermark' disease of cricket-bat willows [*Salix caerulea*, attributed by W. R. Day to *Bacterium salicis*: ibid., iv, p. 321; cf. also ibid., xiii, p. 66] is stated to be still causing heavy damage in parts of Essex, with the result that the County Council has ordered the compulsory felling of infected trees.

Birch seedlings have suffered severely of late years from defoliation caused by the leaf rust, *Melampsoridium betulinum* [ibid., viii, p. 344].

BERGENTHAL (W.). **Untersuchungen zur Biologie der wichtigsten deutschen Arten der Gattung Stereum.** [Investigations on the biology of the most important German species of the genus *Stereum*.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 8–12, pp. 209–236, 26 figs., 1933.

The writer describes in detail the results of his investigations at the Münden (Hanover) Forestry College on the biology of the principal species of *Stereum* found in German forests and wood piles. Although under natural conditions the fungi under observation are marked by their preference either for hard- or soft-woods (e.g., *S. sanguinolentum* [*R.A.M.*, x, p. 572] was found only on conifers, *S. hirsutum* [ibid., xii, p. 664], *S. rugosum* [ibid., xii, p. 44], and several others on broad-leaved trees), in culture they grew and sporulated equally well on both. *S. gausapatum* [ibid., xi, p. 497], however, was exceptional in this respect, growing only on oak wood or in extracts therefrom, while all the others tested grew well in extracts from various kinds of wood. The presence of resin does not deter the hardwood-inhabiting species of *Stereum* from penetrating conifer wood. Oak heartwood showed a high degree of resistance to fungous infection, apparently not attributable to its richness in tannin which is dissolved by the species concerned. The growth of these organisms can evidently be checked by certain substances such as are peculiar, for instance, to oak heartwood when contrasted with that of the beech. The fungi studied can utilize any of the carbohydrates, including pure cellulose, which is, indeed, completely disintegrated notwithstanding the typically 'white' character of the rots [cf. ibid., xi, p. 343]. In damp situations *S. rugosum* forms large canker-like swellings on oaks, infection starting at a withered branch; *S. quercinum* Potter is considered by the author to be a synonym of this species.

GEORGEVITCH (P.). **Bolest Brestova u Slavonskim šumama.** [The Elm disease in Slavonic forests.]—*Inst. Recherch. Forest. Belgrade, 1933*, pp. 1–32, 2 pl., 1 fig., 1933. [German abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 6, p. 127, 1933.]

From the wood of elms in the forests of Jugo-Slavia, where a rapidly progressive die-back has been in evidence since 1925, the writer isolated a new rod-shaped bacterium, *Bacillus ulmi*, which

is considered to be the agent of the disease [cf. *R.A.M.*, viii, p. 343]. *Graphium* [*Ceratostomella*] *ulmi* never developed in bouillon cultures from infected wood, so that the die-back in Jugo-Slavia is apparently quite distinct from that occurring in other parts of Europe [ibid., xii, p. 734 *et passim*].

BOUDRU (M.). **Quelques notes sur la biologie du Ceratostomella ulmi (Schwarz) Buisman, agent de la thyllose parasitaire de l'Orme.** [Notes on the biology of *Ceratostomella ulmi* (Schwarz) Buisman, the agent of parasitic tylosis of the Elm.] *Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, ii, 4, pp. 310–346, 2 pl., 2 graphs, 1933. [Flemish, German, and English summaries.]

In this paper the author gives a detailed account of his investigations (conducted to obtain data on which curative measures to control die-back of elms might be based) into the biology of *Ceratostomella ulmi* [*R.A.M.*, xiii, p. 196]. The results obtained [which are tabulated, expressed graphically, and fully discussed] may briefly be summarized as follows.

C. ulmi grows with difficulty in liquid media, though media containing peptone suit it fairly well.

In a peptone medium the best growth, judged by weight, occurred at P_H 3·2 and in asparagin at 4·4, while between P_H 4·4 and 7·4 the reaction of the medium exercised no appreciable influence on growth. In media of low initial acidity (P_H more than 5) a mycelium with conidial fructifications of the *Cephalosporium* type develops, while in those of high initial acidity (P_H less than 5) a yeast form predominates. The fungus increases the acidity of the medium, does not reduce colouring agents, and possesses two isometabolic points (P_H values at which growth does not alter the reaction of the medium), one (P_H 3·7) for the mycelial, and the other (P_H 2·9) for the yeast, form. It shows a wide range of adaptability as regards its nutritive requirements.

A study *in vitro* showed that while mercuric chloride and nickel sulphate (1 in 2,000) had very little fungicidal effect on *C. ulmi*, janus green, aniline green, brilliant green (1 in 250,000), chinosol, ethyl mercury chloride (1 in 1,000,000), sunoxol [ibid., xi, p. 622], and malachite green (1 in 2,000,000) were all remarkably active in this respect.

A bibliography of 38 titles is appended.

HOTSON (J. W.). **Endothia parasitica in Washington.**—*Mycologia*, xxv, 6, pp. 549–550, 1933.

During the summer of 1932 American chestnuts (*Castanea dentata*) at Seattle, Washington, were found to be attacked by blight due to *Endothia parasitica* [*R.A.M.*, xii, p. 601] not hitherto recorded in the State. All the infected trees were five to eight years old and had been raised in the same nursery from seed from a reputedly healthy region in New York State. The original infections were all at or near the ground, and only one secondary infection was observed on an upper branch. If, as seems probable, the fungus was introduced into Washington on the imported seed, its slow method of attack differs from its behaviour in the eastern

States. Both at Agassiz, British Columbia, and Gunter, Oregon, where the chestnut blight fungus was reported in 1914 and 1929, respectively, the disease appears to have been eliminated.

CURZI (M.). **La 'Phytophthora (Blepharospora) cambivora' Petri sul Noce.** [*Phytophthora (Blepharospora) cambivora* Petri on Walnut.]—*Rendic. R. Accad. Lincei*, xviii, Ser. 6a, 12, pp. 587–592, 1933.

Early writers on the 'ink disease' of chestnuts (*Castanea sativa* M.) in Italy referred to a similar disease, which some thought to be identical, on the walnut (*Juglans regia*), but the cause of the former condition, *Phytophthora cambivora*, discovered by Petri in 1917 [cf. *R.A.M.*, iii, p. 245; vi, p. 380; xiii, p. 65], was not detected on diseased walnuts until isolated by the writer in August 1932, from seedlings growing near chestnut seedlings in a nursery in the vicinity of Rome. Both hosts were affected by a similar disease, which attacked about 70 per cent. of the young walnuts while only scattered chestnut seedlings showed typical ink disease. In both cases a similar phycomycetoid mycelium was present in the cambium and cortical parenchyma and this was isolated in culture from 5 chestnuts and 12 walnuts and proved to be *P. cambivora*, identical with isolations made by the writer from young chestnuts in Sardinia and others obtained from Petri and Dufrénoy in Italy and France, respectively. Inoculations with the two Roman isolations were successful on young walnut and chestnut plants, about 6 cm. in diameter at the base of the stem, the mycelium being inserted into cortical wounds. At the end of three months the brown streaks of infection were 14 and 20 cm. in length on walnut and chestnut, respectively, when the walnut strain was used, and 10 and 30 cm. when that from chestnut was employed, the breadth varying from 1·5 to 4 cm.

It is evident from these results that the collar rot of walnuts frequently recorded in Italy under the names of 'nerume', 'mal nero', and gummosis [ibid., i, p. 284; iii, p. 524] and in France as 'pourridié', 'mourios', etc. [ibid., i, p. 77; vi, p. 563] is more likely to be due to *P. cambivora* than to the other parasitic organisms, such as *Bacterium juglandis* and *Armillaria mellea*, to which it has been attributed. So also the obscure walnut blight reported by Baudyš in Czecho-Slovakia [ibid., x, p. 79] is very possibly of similar origin. In California a walnut disease, the symptoms of which recall ink disease, has been attributed provisionally to *P. cactorum* [ibid., xi, p. 339] and in Australia *P. parasitica* has been recorded as the cause of a collar rot of this tree [ibid., ix, p. 567], but it would appear that these determinations require to be checked, since in California it is stated that more than one species is present [ibid., x, p. 214], while the description of the causal fungus in Victoria seems to resemble that of *P. cambivora* more than *P. parasitica*.

CURZI (M.). **La maladie de l'encre sur le Noyer (Juglans regia).** [Ink disease on Walnut (*Juglans regia*).]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, v, 12, pp. 341–344, 1933.

This is an account in French of the writer's discovery of *Phyto-*

phthora cambivora as the cause of the ink disease ('mal nero') of walnuts in Italy [see preceding abstract].

RIGOTARD (L.). **Le dépérissement du Noyer dans le Dauphiné.** [The dying-off of the Walnut in the Dauphiné.]—*Comptes rendus Acad. d'Agric. de France*, xix, 29, pp. 1007–1012, 1933.

In this note (preceded by an introductory statement by P. Viala), the writer discusses the factors underlying the widespread dying-off of walnut trees in the Dauphiné, the incidence of which has risen, since the excessively severe winter of 1928–9, from an average of 1 or 2 to 4 or 5 per cent. per annum [cf. *R.A M.*, ii, p. 187 and preceding abstracts]. Contributory causes of the damage are believed to be exhaustion and insufficient humidity of the soil, for which appropriate remedies are suggested.

WEBER (G. F.). **Pecans infected with Nematospora coryli Pegl.** —*Phytopath.*, xxiii, 12, pp. 1000–1001, 1 fig., 1933.

Nematospora coryli was isolated from stored pecan [*Carya pecan*] nuts in Florida in January, the organism in pure cultures on potato-dextrose agar being indistinguishable from that previously isolated from orange, grapefruit, tangerine, Satsuma [*Citrus nobilis* var. *unshiu*], and tomato in the same State [*R.A.M.*, xii, p. 594]. This appears to be the first record of the fungus on pecans. Infection cannot be detected until the shells are removed, when it is found on the convex outer portion of the kernels, producing a brown discoloration similar to the kernel spot caused by sucking insects [*Nezara viridula*: ibid., ii, p. 283], with which *N. coryli* is in fact generally associated. The lesions are slightly depressed, shrunken, and show a definite margin; the underlying tissue is flaccid and faintly discoloured. It is thought probable that the fungus is conveyed to the nuts by *N. viridula*, which has been found feeding on a number of hosts from the necrotic areas on which *N. coryli* has been isolated.

STEVENS (N. E.). **Life history and synonymy of Physalospora glandicola.**—*Mycologia*, xxv, 6, pp. 504–508, 1933.

The fungus reported by O. C. Boyd (*Plant Disease Reporter, Suppt.* 85, p. 67, 1933) to be causing twig blight of oaks in Massachusetts and simultaneously investigated by H. S. Jackson near Toronto, Canada, is determined as *Physalospora glandicola* (Schw.) comb. nov. (syns. *Sphaeria glandicola, S. gallae, Sphaeropsis hyalina, S. quercina*, and *Dothiorella quercina*). *P. glandicola* is characterized by simple or compound pycnidia in black, erumpent stromata, 1 to 2 mm. in diameter; light brown, eventually 1-septate pycnospores with a thick, glassy wall, 12 to 17 by 18 to 25 μ, mostly 15 to 16 by 21 to 24 μ; perithecia up to 200 or 225 μ in diameter, with asci containing eight light brown, usually biseptate ascospores, 12 to 16 by 28 to 35 μ (14 to 15 by 30 to 33 μ).

LIESE (J.). **Anzucht gesunder Pappeln- und Aspenpflanzen. II. Teil.** [The cultivation of healthy Poplar and Aspen plants. Part II]—*Forstarchiv*, ix, 7, pp. 111–115, 9 figs., 1933.

Attention is drawn to some prevalent defects in poplar (*Populus*

nigra, *P. canadensis*, *P. robusta*, and other species) and aspen [*P. tremula*] cultivation in Germany, which are liable to promote the heart rot caused by *Polyporus* [*Fomes*] *igniarius* [*R.A.M.*, x, pp. 416, 420]. Of recent years the demand for aspen wood has been so brisk that attempts at propagation by seed were made in various parts of the country, but at any rate in East Prussia the heat wave of 1930 and the ravages of rusts (*Melampsora* spp.) and *Verticillium albo-atrum* in 1932 have counteracted this development.

SERVAZZI (O.). **Un fungo nuovo del Pioppo canadese (Pyrenochaetina variabilis sp. n.)** [A new fungus on Canadian Poplar (*Pyrenochaetina variabilis* sp. n.)]—*La Difesa delle Piante*, x, 6, pp. 113–122, 1 pl., 1 fig., 1933.

Two-year-old Canadian poplars [*Populus canadensis*] growing in a nursery at Moncestino, Italy, wilted as a result of attack on the cortex of the roots by a *Pyrenochaetina* named by the author *P. variabilis* n. sp. The fungus [the morphological characters of which are fully described and a Latin diagnosis of which is given] was characterized by sparse, black or brownish-black, generally superficial or erumpent pycnidia, averaging 200 to 215 by 160 to 175 μ, usually with an ostiolate papilla; the pycnidial wall was 10 to 15 μ thick and consisted of two or three layers of irregularly polyhedric cells, 3·5 to 6 μ broad. On the surface were 10 to 35 bristles, usually around the ostiole, 65 to 200 μ (averaging 100 to 120 μ) by 2·6 to 3·5 μ in diameter. The hyaline, elliptical or ovoid, occasionally spheroid spores measured 3 to 3·3 by 2·2 to 2·5 μ. No sporophores were observed, the spores being apparently formed pleurogenously on deliquescent hyphae occupying the centre of the pycnidium.

From the abundant mycelium in the living tissues the author deduces that *P. variabilis* is a true parasite of the root cortex. It is, however, a weak one, fatal only to young poplars growing in unsuitable conditions.

VENKATA RAO (M. G.). **A preliminary note on the leaf-curl mosaic disease of Sandal.**—*Indian Forester*, lix, 12, pp. 772–777, 2 pl., 1933.

A description is given of a new disease of sandal (*Santalum album*) in Mysore for which the name of 'leaf curl mosaic' is proposed. So far 138 trees have been found affected in the Jakkur plantation, Bangalore, and a few elsewhere.

The early stages of the disease are characterized by conspicuous interveinal mottling and slight rolling of the mature leaves, sometimes accompanied by a reddish-brown marginal discoloration in the pigmented types of sandal. A marked drooping habit is generally shown by the branchlets and foliage. At a more advanced stage even quite young leaves show a marginal ruffling, followed by wrinkling, mottling, progressive dwarfing, curling, and discoloration ranging from greenish-yellow to reddish-brown. In contrast to spike disease [*R.A.M.*, xiii, p. 198], the surface reduction in mosaic leaves is usually greater in length than in breadth. The thickness of the petioles is considerably diminished and the

leaves become brittle and fall prematurely. The twigs and branches die back gradually and adventitious shoots appear on the stem, producing very attenuated leaves that are rapidly shed. The fruits of diseased trees are malformed and fall prematurely. A table is given showing the principal differences between leaf curl mosaic and spike disease.

In order to determine the transmissibility of the new disease, two five-year-old sandal trees raised from seed were inoculated at the Central Nursery, Bangalore (nearly six miles from the infected plantation at Jakkur) with six ring-bark grafts on different twigs among the lower branches. In this method the healthy twigs are girdled by removing the bark all round to a width of about an inch and replacing it with that of an infected twig of corresponding dimensions, the part being then bandaged. In these tests the grafting material was taken from two trees in the final stage of the disease. Twenty-five days after inoculation, the new leaves produced in some of the upper branches showed distinct marginal ruffling, followed in about a fortnight by severe wrinkling. Six weeks after inoculation nearly half the branches in the trees were affected, and small curled leaves were produced by an adventitious shoot on one of the lower branches. Mottling began to develop two months after inoculation. These symptoms were confined to the new leaves developing after the grafting operation, and generally appeared first on the vigorously growing upper branches, only two out of twelve of those actually inoculated in the lower parts of the trees becoming affected. These data are considered to indicate that leaf curl mosaic, unlike spike, spreads very rapidly from one part of an infected tree to another.

LACHMUND (H. G.). **Mode of entrance and periods in the life cycle of Cronartium ribicola on Pinus monticola.**—*Journ. Agric. Res.*, xlvii, 10, pp. 791–805, 1 diag., 1933.

The results of ten years' field studies in western North America of the early stages of blister rust (*Cronartium ribicola*) on the native western white pine (*Pinus monticola*) [*R.A.M.*, xii, p. 603] showed that on trees over 3 ft. in height and more than 8 years old the duration of the incubation period to the production of visible bark symptoms usually ranges from about 20 to 26 months, but is sometimes considerably longer, depending on the time of infection, seasonal conditions, and altitude. After infection the minimum time required for canker formation in such trees is generally not less than 16 months, although recent data from Idaho indicate that in certain cases the minimum might have been as low as 9½ months. On younger trees, not over 5 years old, the incubation period is shorter, and incipient cankers were observed to form after a minimum of 6 months.

The time required for the production of pycnospores after the incubation period ranges from less than 1 month to 10 months. Aecidiospores are usually formed from 6 months to 2½ years after the production of the pycnospores, but sometimes the intervening period extends over 3 or even 4 years, and under certain conditions occasionally ranges as high as 10 to 20 years. On the younger trees it rarely extends beyond 2½ years.

BAGCHEE (K.) [D.]. **Investigations on the infestation of Peridermium himalayense, Bagchee, on Pinus longifolia. Part II. Cronartium himalayense, n. sp., on Swertia spp. Distribution, morphology of the parasite, pathological study of the infection, biological relationship with the Pine rust, and control.**—*Indian Forest Records* (Bot. Ser.), xviii, 11, 66 pp., 16 pl. [1 col.], 2 graphs, 1933.

In this paper the author gives a full account of his investigations of the biological relationship between *Peridermium himalayense* (the serious blister rust attacking *Pinus longifolia* in north and north-western India) and its *Cronartium* stage, *C. himalayense* n. sp. (*Uredo opheliae* Syd.) found on species of *Swertia* in the same region [*R.A.M.*, ix, pp. 146, 279], as well as into the morphology of *C. himalayense*, its manner of infection, and its possible control.

C. himalayense is characterized by caulicolous, sub-phellodermal, small, inconspicuous, scattered pycnidia forming minute, blister-like swellings with an orange-yellow exudation. The aecidial (*Peridermium*) and uredo stages have been described in earlier publications. The hypophyllous, cylindrical, walnut-brown teleutosori (which occur on all the green parts of the affected species of *Swertia*) measure 750 by 80 μ on an average; the light brown, cylindrical to polyhedral, occasionally spindle-shaped teleutospores have rounded corners or are obtuse at both ends, and average 37·5 by 18·5 μ; they have a smooth wall 0·08 to 2·5 μ thick. The delicate, hyaline, globoid sporidia measure 5·5 to 6·5 μ in diameter.

S. alata, S. angustifolia, S. cordata, S. paniculata, and *S. purpurescens* were inoculated with aecidiospores from the stem of *P. longifolia* and two weeks later the uredo stage was reproduced on *S. alata, S. angustifolia,* and *S. cordata* (the first two of which became heavily and the third slightly, infected). These are the three species that have been found naturally infected.

The aecidiospores of *C. himalayense* are capable of dissemination by the wind over long distances. The uredospores chiefly spread infection locally on *Swertia*. The teleuto stage produces a large quantity of sporidia just before or after the host dies. Their formation has been observed from the middle of October to the middle of November. The structure of the spores indicates that they are capable only of local dissemination, but they are produced in sufficient quantity to cause heavy reinfection of pines in the neighbourhood.

The only suitable method of controlling this pine blister rust consists in eradicating the alternate host. As the range of aecidiospore dissemination was tentatively determined as 300 yards, pine stands should be kept at this distance from *Swertia* spp. A scheme has been suggested for the eradication of *Swertia* for three successive years and thereafter during alternate years for six eradication years in certain areas. Pines over 30 years old appear to remain unaffected by the disease.

CLARK (A. F.). **The horntail borer and its fungal association.**—*New Zealand Journ. of Sci. & Techn.*, xv, 3, pp. 188–190, 1933.

A fungus, which appeared to agree with a standard culture of

Stereum sanguinolentum [see above, p. 334] from England, has been found almost constantly present in the wood of *Pinus radiata* infested with the horntail borer, *Sirex noctilio*, in New Zealand, as well as on the larvae and adult females of the insects in the trees. Cartwright has shown in England that *S. cyaneus* introduces the accompanying Basidiomycete into the wood on the accomplishment of oviposition, and it is apparent also from the present studies that the connexion between insect and fungus is extremely close. In fact, infestation by the former seems to depend on the presence of the latter in the host.

CUMMINS (J. E.). **Blue stain in Pinus radiata (insignis) timber. Some preliminary experiments with case stock.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 244–252, 1 fig., 1 pl. [opp. p. 308], 1933.

Owing to the increased use in Australia of locally grown soft-woods the problem of the development of blue sap stain during stacking has become of major importance. This stain on *Pinus insignis* from two localities in Victoria was recently found by Miss A. M. Eckersley to be due in one locality to two fungi closely related to *Ceratostomella pilifera* [*R.A.M.*, x, pp. 146, 216] and *C. coerulea* [cf. ibid., xi, p. 216] and in the other to *Hormonema dematioides* [ibid., ix, p. 77; xi, p. 616]. *P. insignis* is largely used for making cases, but is often insufficiently seasoned so that the development of blue stain is common.

In a test [full details of which are given] carried out at one factory a large number of boards of *P. insignis* cut the day before were completely immersed for not less than 5 seconds in a cold solution of lignasan, an American proprietary substance stated to contain 0·43 per cent. ethyl mercury chloride [ibid., xii, pp. 345, 668], made by dissolving ½ lb. of the dry powder in 20 galls. of cold water, or in a solution (maintained at 140° F.) made by dissolving 14 lb. of washing soda and 6 lb. bicarbonate of soda in 20 galls. water, after which they were stacked either 'lap' or 'strip' fashion for about nine weeks, untreated boards being similarly stacked as controls.

The lap-stacked, untreated boards and those treated with soda had 71 and 40 per cent., respectively, of the total area blue-stained, whereas the lignasan-treated boards showed no stain at all. Of the strip-stacked, untreated boards 31 per cent. of the total area was stained, whereas no stain developed in the lignasan-treated boards.

Both the treatments apparently favoured the development of surface moulds other than the blue stain fungi, possibly by increasing the P_H value of the surface of the wood. Rapid drying in the stack diminished this effect of the lignasan treatment.

NIKOLAYEVA (Mme T. L.). Род **Merulius** в СССР. [The genus *Merulius* in USSR.]—*Советская Ботаника* [*Botany of the Soviets*], *1933*, Leningrad, 5, pp. 96–111, 12 figs., 1933.

In this paper the author gives brief Russian technical descriptions of 17 species of *Merulius* (including *M. domesticus*, *M. minor*, *M. silvester*, and *M. sclerotiorum*, which were separated from *M.*

lacrymans by Falck in 1907, and which are accepted as distinct species by the writer) [*R.A.M.*, viii, p. 280], together with notes on their taxonomy and geographical distribution, as well as on the substrata on which they are most commonly found in nature. Five of the species named have not yet been recorded on the territory of the Russian Soviets. A key for the identification of the species is given.

WILSON (S. E.). **Changes in the cell contents of wood (xylem parenchyma) and their relationships to the respiration of wood and its resistance to Lyctus attack and to fungal invasion.**—*Ann. of Appl. Biol.*, xx, 4, pp. 661–690, 11 figs., 1933.

The main part of this paper is given to an account of experiments, the results of which showed that the starch normally present in the sapwood of felled timber disappears in the course of a slow seasoning process, for a period varying with the species of tree, the season of felling, the width of the sapwood, and temperature. The experiments further suggested that the disappearance of the starch results from the continued activity of the sapwood cells. When the latter are killed by rapid seasoning, the starch remains unaltered in the timber, and such timber is very liable to attack by the *Lyctus* powderpost beetles and by fungi. The latter fact was demonstrated by observations that ash planks which had been cut shortly after felling became discoloured, while planks sawn from logs six or more months after felling remained 'bright'. Examination of the former showed the presence of brown fungal hyphae in the wood to a depth corresponding to the starch zone. Comparative infection tests with an unidentified species causing sap stain showed that blocks of rapidly air-dried, steamed, or oven-dried ash sapwood were stained throughout after five weeks, while starch-free blocks of the same wood showed only a slight growth of the fungus and no internal discoloration.

MOLL (F.). **Neue Versuche über Holzkonservierung. Das Osmose-Verfahren.** [New experiments in wood preservation. The osmosis process.]—*Forstwissensch. Centralbl.*, lv, 21, pp. 755–757, 1933.

Attention is drawn to the recent establishment, near Goslar in the Harz Mountains, of a plant for the preservation of timber by osmosis, the basis of which consists in the application to the freshly felled, decorticated wood of a protective paste combined with water as a solvent and an adhesive. By diffusion and osmosis, the highly concentrated protective substances migrate in the direction of low concentration, i.e., the interior of the wood. After the application of the paste the logs are piled up and covered with temporary roofing to keep them dry and prevent the evaporation of the water. Pine and spruce logs of the normal dimensions for telegraph poles and the like are impregnated in the course of ten or twelve weeks by this process. The paste may also be applied to the standing tree just above the root collar, a strip of the rind of which is removed for the purpose. The protective salts are carried upwards with the rising sap, and within a few days the

subcortical tissues are rendered safe from infection, e.g., by the blueing fungi [*Ceratostomella* spp.].

ANDERSON (M. E.). **Fusarium resistance in Wisconsin Hollander Cabbage.**—*Journ. Agric. Res.*, xlvii, 9, pp. 636–661, 3 figs., 1 graph, 1933.

An account is given of the author's studies since 1930 in Wisconsin of the genetical nature of resistance to cabbage yellows (*Fusarium conglutinans*) [*R.A.M.*, xiii, p. 2] in the Wisconsin Hollander cabbage variety [ibid., x, p. 4], as indicated by the behaviour in the field and under controlled conditions in the greenhouse of different progenies of self-pollinated plants and crosses of the variety with homozygous resistant and homozygous susceptible plants from other varieties. Under severe field conditions the F_1 self-pollinated progeny was found to comprise individuals ranging from completely susceptible to highly resistant, indicating the existence of modifying factors for resistance. The F_2 progeny of the crosses with homozygous susceptible plants did not contain individuals with the original resistance of Wisconsin Hollander, while that of the crosses with homozygous resistant plants, when grown in inoculated soil at a constant soil temperature, segregated in the ratio of three resistant to one susceptible. Segregation of factors for resistance was also observed in the F_1 and F_2 progenies from the Hollander self-pollinated plants, some of the F_2 progenies exhibiting a higher and others a lower degree of resistance than the progenies from which the mother plants had been selected. Many plants of the more resistant progenies showed but slight symptoms in the field or at a controlled soil temperature of 20° to 22° C., their growth not being materially checked by the disease, and recovery being frequent.

At temperatures above 22°, however, the resistance of Wisconsin Hollander tends to be broken; the most resistant line of self-pollinated plants which was obtained in the work became 100 per cent. diseased at a constant soil temperature of 24°. This would indicate that the resistance of this variety is of an intermediate degree, as compared with that of homozygous resistant lines [loc. cit.]. There was no evidence of increased resistance of Wisconsin Hollander seedlings with advance in age, within the limits studied.

TENNENT (R. B.). **The Bruce club-root resistant Turnip.**—*New Zealand Journ. of Agric.*, xlvii, 5, pp. 297–301, 1933.

In a field trial of resistance to *Plasmodiophora brassicae* carried out in New Zealand in 1931 Bruce Purple Top turnips (English and Scotch seed) [*R.A.M.*, xii, p. 6], the Wallace Green Top selection from it, and Purple Top Aberdeen developed 8·3, 5·2, 10·1, and 25·8 per cent. infection, respectively; the Bruce and Wallace roots also proved superior in yield and quality as fodder. In a large-scale test carried out the following year with Bruce, Green Top Scotch Aberdeen, and Botfield the corresponding figures were, respectively, 2·3, 6, and 44 per cent. Numerous trials conducted by the local farmers fully confirmed the resistance to *P. brassicae* shown by the Bruce variety.

MAGEE (C. J.). **Whiptail disease of Cauliflowers can almost be eliminated by liming.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 911–914, 2 figs., 1933.

In New South Wales certain cauliflower varieties, especially early ones, are seriously affected nearly every year by the physiological disorder, due to high soil acidity, known as whiptail [*R.A.M.*, iii, p. 565]. Quite commonly every plant in a crop is affected, though more often 20 to 50 per cent. of the plants of early varieties may show the condition.

The results of an experiment on control by liming [details of which are given] are considered to justify a tentative recommendation of a dressing of one and a half to two tons of agricultural hydrate of lime per acre, at least one month before the seedlings are set out. The seed-bed should also be limed some weeks before sowing, at the rate of 1 lb. hydrate of lime per sq. yd.

KENDRICK (J. B.). **Seedling stem blight of field Beans caused by Rhizoctonia bataticola at high temperatures.**—*Phytopath.*, xxiii, 12, pp. 949–963, 3 figs., 1 graph, 1933.

A destructive stem blight of Red Mexican, Red Kidney, and Pink bean (*Phaseolus vulgaris*) seedlings in the central valleys of California is caused by *Macrophomina phaseoli* in its sterile stage (*Rhizoctonia bataticola*) [*R.A.M.*, xii, p. 763]. The average mean diameter of the sclerotia consistently isolated from diseased material (no pycnidia were found) was 75·4 μ, indicating that the organism falls within Haigh's C group [ibid., xii, p. 727]. The disease is characterized by black, sunken lesions on the upper part of the hypocotyl, sometimes involving the epicotyl and plumule and rapidly killing the plant. When not destroyed in the seedling stage, affected plants often collapse later at the point where the stem is weakened by the canker. Infection occurs on the hypocotyl at the base of a cotyledonary petiole before or soon after the emergence of the seedling from the soil, possibly through the meristematic tissue in this region.

Epidemics of stem blight coincided in 1929, 1931, and 1932 with the emergence of the seedlings during or immediately following periods of ten days or more with mean air temperatures of 80° F. or above and a daily maximum of about 100°. No such periods occurred in 1930 and epidemics were absent. Bean seedlings in pots of sterilized, inoculated soil contracted typical seedling blight in two series of tests in June and July, 1931, when the daytime soil temperatures averaged 95° to 113° and 98° to 107° at 1 in., and 81° to 95° and 82° to 89° at 3 in., but not during two series in September and October with corresponding averages of 74° to 82° and 72° to 80°, and 69° to 76° and 69° to 77°, respectively.

BRUNER (S. C.) & JENKINS (ANNA E.). **Identity and host relations of the Elsinoe of Lima Bean.**—*Journ. Agric. Res.*, xlvii, 10, pp. 783–789, 1 fig., 1933.

The results of inoculation experiments [which are described in detail] from 1930 to 1932 at the Agricultural Experiment Station at Santiago de las Vegas, Cuba, supported by field observations, showed that the species of *Elsinoe* which causes Lima bean

(*Phaseolus lunatus*) scab, and which had been tentatively identified as *E. canavaliae* [*R.A.M.*, x, p. 577; xiii, p. 72], is not pathogenic to *Canavalia gladiata, C. ensiformis, Calopogonium caeruleum, Dolichos lablab, Stizolobium deeringianum*, French beans (*P. vulgaris*), or peas. For this reason, and until the other two species of *Elsinoe* recorded on legumes, namely, *E. canavaliae* and *E. calopogonii*, have been studied further, the authors consider it advisable to regard the Lima bean organism as a distinct species, for which the name *E. phaseoli* Jenkins is suggested. An English technical description and a Latin diagnosis of this species are appended.

McRae (W.) & Shaw (F. J. F.). **Influence of manures on the wilt disease of Cajanus indicus Spreng. and the isolation of types resistant to the disease.**—*Imper. Council of Agric. Res., Scient. Monograph* 7, 68 pp., 2 pl., 13 graphs, 1933.

Studies at the Pusa Agricultural Research Institute, India, of the effect of different manures on wilt (*Fusarium vasinfectum*) of pigeon pea (*Cajanus indicus*) [*R.A.M.*, x, p. 399; see also xi, pp. 424, 426] in permanent manurial plots showed that applications of superphosphate at the rate of about 13 lb. of P_2O_5 per acre or of farmyard manure at the rate of 30 lb. of nitrogen per acre or of superphosphate and green manure together increased infection, whereas green manure alone reduced it. Chemicals other than the superphosphate had no effect on the incidence of the disease. Each year there was a statistically significant difference between the amount of infection in the green manure plus superphosphate plots and that in the plots treated with superphosphate alone, demonstrating that the green manure prevented the superphosphate from producing its full effect in increasing wilt.

Evidence was obtained that in unmanured, highly infected land 92 per cent. of the plants might become infected, and that plants 9 ft. distant from a point where infection existed at the beginning of the season might develop wilt. The incidence of infection did not correspond with the amount of soil moisture and the difference in the P_H values of the soil in the various plots was too slight to account for the difference in the amounts of infection present in them; in culture the fungus grew well at P_H values corresponding to those of the plots.

The average stem diameter of the plants in the superphosphate plots was 50 per cent. greater than that of the plants in the plots not given superphosphate, while the average weights of the shoots at harvest time (four seasons taken together) for two series of superphosphate plots were, respectively, 47 per cent. and 37 per cent. higher than those of the shoots in plots not given superphosphate.

In a given time the rate of growth of the mycelium of *F. vasinfectum* in liquid media containing different amounts of soluble phosphate increased with the concentration of the phosphate up to 0·5 per cent., after which it declined.

During 1923, plants which had survived in an artificially infected field were selected and seed from each was sown separately in the same field in 1924–5; of the resulting lines two (3 and 16) were

found to incur less loss than the remainder. The single lines fell into certain morphological groups and it became apparent that resistance was correlated with the morphological features of one of these, the group I (1), and a line (type 82) obtained from an extraneous series, while susceptibility appeared to be associated with those of types 5, 15, and 59. Selections from line A2 of group I (1) yielded a type (80) which since 1930 has shown resistance in field trials in infected land. In 1927–8 and 1928–9 (figures for these years being chosen because wilted plants were in both seasons very much fewer than they were, on an average, for the previous six years) the plots from mixed seed showed 3,594 and 5,701 wilted plants, respectively, whereas in 1929–30 and 1931–2 the type 80 plots showed only 131 and 3 wilted plants, respectively. Six pairs of plots each of one quarter of an acre and on highly infected soil were sown with seed of types 5 and 80 in alternate rows, the seed of the former type giving 2,384, and that of the latter 70 diseased plants, the type 5 plots averaging 63 and type 80 plots 1·7 per cent. wilted plants. It is considered that the resistance of type 80 is of a very high order.

The evidence obtained indicated that resistance is inherited independently of morphological characters. A resistant variety of pigeon pea grown in a field which has been under this crop for three or more seasons loses its resistance, though this factor is not transmitted to the next generation, the soil conditions responsible affecting the soma but not the germ tissue of the plants.

Types 16, 41, 50, and 51, obtained from the same series as type 82, also showed some resistance.

SATTAR (A.). **On the occurrence, perpetuation and control of Gram (Cicer arietinum L.) blight caused by Ascochyta rabiei (Pass.) Labrousse, with special reference to Indian conditions.**—*Ann. of Appl. Biol.*, xx, 4, pp. 612–632, 1 map, 3 graphs, 1933.

An account is given of the results obtained so far in the investigation, started in 1922, of the very destructive blight of gram (*Cicer arietinum*) caused by *Ascochyta rabiei*, particularly in the north of the Punjab [*R.A.M.*, xii, p. 264]. The disease is most prevalent and destructive in regions with a rainfall of 6 in. and over during the period from October to April when the crop is on the land, annually killing some 50 per cent. of the plants; when the rainfall during this period is under 6 but not under 3·5 in. the annual losses are estimated at roughly 25 per cent., while in drier areas the blight occurs rarely and does not cause appreciable injury. It is calculated that in the three districts of Attock, Rawalpindi, and Jhelum, alone, the annual losses caused by it amount to a million rupees [£75,000].

The susceptibility of the plants was found to increase with age, being greatest at the flowering and fruiting stages from February to April, at which time the plant excretes the largest amount of malic acid from the glandular hairs on its surface. Germination of the pycnospores is favoured by the presence of malic or tartaric acid or of acidified carbon (glucose) nutrients (P_H 2·5). In testing the resistance of gram varieties to the blight, inoculations should

be made at the flowering and fruiting stages, as otherwise even susceptible varieties may show a deceptive appearance of resistance.

Though the fungus is carried inside the seed from diseased plants [loc. cit.], the chief mode of transmission from year to year is through seed superficially contaminated with the spores during threshing, experiments having shown that 50 per cent. of such spores germinated after five months' storage at temperatures from 25° to 30° C., and 5 per cent. survived the same period of storage at 35°. Plants raised from seed smeared before sowing with spores of *A. rabiei* were attacked to the extent of 60 to 100 per cent. Infected plant material admixed in the seed was also shown to be an important source of infection, but no definite conclusions could be arrived at in regard to the part played by soil infection in the perpetuation of the disease.

The author considers that the disease could be best controlled by the use of clean seed from disease-free districts, disinfecting contaminated seed in 0·5 per cent. copper sulphate solution for 10 minutes, and treating internally infected seed by pre-soaking in water at 20° C. for six hours, and then dipping it in hot water at 53° for 15 minutes. In a preliminary series of tests, artificially infected gram seeds which were dusted with malic acid before sowing germinated normally, but all the seedlings died off from severe infection when 1 to 1½ in. high. This suggests the possibility of using this method for preventing seedlings from infected seeds from reaching the surface of the soil if planted sufficiently deep. The introduction of a system of crop rotation wherever possible, and the removal of all refuse of the preceding crop from the fields, are also recommended.

NEUWIRTH (F.). **Ökologie der aufgehenden Rübe mit Berücksichtigung ihrer Krankheiten. Die fakultativen Parasiten, ihr gegenseitiges Verhältnis und ihre Beziehung zur Wirtspflanze. I. Teil.** [The ecology of the germinating Beet with reference to its diseases. The facultative parasites, their mutual relationship, and their connexion with the host plant. Part I.]—*Zeitschr. für Zuckerind.*, lviii, 13, pp. 97–103, 1933.

In this paper (translated from the Czech original in *Listy Cukrovar.*, li, p. 309, 1933, by V. Czurda) the writer pursues his studies on the ecological factors influencing the occurrence of disease in germinating beets [*R.A.M.*, x, p. 425]. It was clear from inoculation experiments with *Phoma betae* on sterilized beet slices in 1927–8 that the fungus secretes thermostable toxic enzymes which penetrate the tissues by osmosis in advance of the hyphae. The cellulose membranes are dissolved by cellulase, the secretion of which by the fungus was established by its ability to use filter paper in artificial culture as the sole source of carbon. A further production of toxic enzymes by the fungus takes place on the flower sheath and parts of the germinating seed cluster. Seed treatment reduces this source of infection but does not wholly eliminate the risks, since the liability of the seedling to disease is far greater at the stage of sloughing the primary root cortex, on which the various fungi involved in the production of seedling blight can readily pass from the saprophytic to the parasitic mode

of life. The dangerous period of temporary growth check, before the depleted seed reserves have been replenished by root feeding, may be curtailed by the provision of exceptionally favourable growth conditions. The straw manure commonly applied to improve the physical condition of the soil and combat root rot must be well worked in and evenly distributed, otherwise its organic substances stimulate the saprophytic development of the pathogens. Most authorities are agreed that the hypocotyl is an important site of invasion by the root-rotting fungi, presumably owing to its high nutrient content, especially of invert sugar.

WERNECK (H. L.). **Die Cercospora-Blattfleckenkrankheit der Zuckerrübe und ihre Bekämpfung.** [The *Cercospora* leaf spot disease of the Sugar Beet and its control.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 8, pp. 183–192, 1933.

Heavy losses, estimated at 10 to 55 per cent. of the beet crop, were again caused in Upper Austria in 1932 by *Cercospora beticola* [*R.A.M.*, xi, p. 19], roughly corresponding to a financial reduction of M. 384,000 to 480,000 for the raw material and of M. 1,800,000 for manufactured sugar. A study of the local meteorological data for 1932 indicates that ideal conditions for the spread of a leaf spot epidemic prevailed from mid-July onwards, when the optimum temperature (20° C. and above) and atmospheric humidity (98 to 100 per cent.) for the growth of the fungus frequently coincided. The best time for the application of Bordeaux mixture to the beet crop in Upper Austria would appear to be from 10th to 18th August, but this treatment having been found unprofitable in Germany [ibid., xi, p. 348], careful experimentation is advisable before adopting it. As in the 1929 epidemic, the writer again observed in 1932 that the application of liquid manure at or immediately after the second hoeing (1st to 5th July at the latest) practically prevented infection, and this is undoubtedly the simplest and cheapest way to hold the disease in check.

VERPLANCKE (G.). **Betteraves fasciculées.** [Fasciculate Beet-roots.]—*Sucrerie Belge*, liii, 7, pp. 123–124, 1933.

Beetroots affected by heart rot in Belgium [*R.A.M.*, xiii, p. 210] were observed to develop a crown of small heads round the collar, presumably representing an attempt on the part of the plant to produce new buds. The same phenomenon was artificially induced at the Ghent Botanic Garden by wounding. In addition, therefore, to the hereditary type of fasciation described by Munerati (*Comptes rendus Soc. de Biol.*, cxi, p. 603, 1932), there exists a non-transmissible form due to mechanical injury or pathological causes.

NATTRASS (R. M.). **The white rot disease of Onions in Cyprus.**—*Cyprus Agric. Journ.*, xxviii, 4, pp. 98–100, 2 figs., 1933.

After stating that the export of onions from Cyprus has risen from 7,721 cwt. in 1928 to 31,080 cwt. in 1932 the author reports that the crop in one locality was attacked in 1933 by *Sclerotium cepivorum* [*R.A.M.*, xii, pp. 4, 140], this being the only serious onion disease so far noticed in the island. The white rot symptoms are briefly described and emphasis is laid on the necessity of

planting sets obtained only from disease-free areas; in the affected locality the cultivation of plants of the onion family should be discontinued for eight to ten years.

ABDEL-SALAM (M. M.). **Damping-off and other allied diseases of Lettuce.**—*Journ. Pomol. and Hort. Science*, xi, 4, pp. 259–275, 2 pl., 5 graphs, 1933.

From damped-off lettuce seedlings growing in heated frames, and older plants bedded out in unheated greenhouses near Slough, England, the author isolated most frequently *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, vi, p. 651; xii, p. 133] and a *Pythium*. The latter occurred chiefly in warm soils, in which *C. solani* was rarely isolated from the damped-off lettuce seedlings. A strain of *C. solani* isolated from the rotted collar of a tomato plant growing in a hot greenhouse and differing from the lettuce strains in growth habit and physiological reaction was highly pathogenic to lettuce.

In a more or less saturated atmosphere the optimum soil moisture for attack by the lettuce and tomato strains of *C. solani* was 80 to 90 and 30 per cent., respectively. At 100 per cent. soil saturation the former caused 42 and the latter 58 per cent. damping-off. When lettuce seeds were sown in 100 per cent. saturated soil inoculated with *Pythium*, all damped off, most of them when germination was beginning. Damping-off occurred (especially with the tomato strain of *C. solani*) in soils showing only 20 per cent. saturation. Once begun, damping-off continued even in atmospheres with only 5·1 per cent. saturation.

At soil temperatures of 8° to 30° C. the *Pythium* gave 100 per cent. infection. The optimum temperature for attack by the lettuce strain of *C. solani* was not over 8°, while that for attack by the tomato strain was about 25°.

The lettuce strain of *C. solani* gave a high percentage of attack in leaf mould soil, a low one in sand, and an intermediate figure in various soil mixtures; approximately 100 per cent. attack was obtained in all soil mixtures inoculated with the *Pythium*.

Both strains of *C. solani* attacked by means of a spongy infection cushion below which numerous penetrations took place, while the *Pythium* penetrated the epidermis by single hyphae. All three organisms passed through the cuticle by means of peg-like hyphal outgrowths which after penetration resumed their normal thickness. The hyphae of the lettuce strain of *C. solani* were mainly intercellular and those of the tomato strain and the *Pythium* mainly intracellular.

No evidence was obtained of any action in advance of the hyphal growth on the part of *Pythium* and the lettuce strain of *C. solani*, though there was evidence of lethal action in the collapse of cells beyond the fungus in the tomato strain of the latter organism. The brown colour of the water-soaked region in lettuce seedlings attacked by the three fungi was due to discoloration of the walls of the host cells.

HIURA (M.) & KAWADA (S.). **On the overwintering of Peronoplasmopara cubensis (B. et C.) Clinton.**—*Japanese Journ. of Botany*, vi, 4, pp. 507–513, 1 pl., 1933.

Early in 1933 many cucumber leaves infected by downy mildew

(*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) were collected in a greenhouse at the Gifu Agricultural College, Japan [*R.A.M.*, viii, p. 698], and some time later a few of these, especially the small upper ones of severely diseased plants, were found to contain oospores. The connexion between these organs and the mycelium was readily traced by the dissection of detached lesions immersed for not less than 24 hours in 20 per cent. potassium hydroxide. From June onwards oospores are found even in young lesions showing little discoloration, while mature oospores are commonly present in the lesions of apparently vigorous leaves attached to the plant. The oogonia of *P. cubensis* are obovoid to ellipsoidal or irregularly piriform, 28 to 56 by 24 to 44 μ, the antheridia clavate to globose, 14 to 22 by 10 to 16 μ, and the spherical, rarely obovoid to ellipsoid oospores, with a hyaline to pale yellowish, smooth wall, 1·5 to 3·5 μ in thickness, measure 22 to 42 μ in diameter. The oospores found by Rostowzew (*Flora*, xcii, p. 405, 1903) in cucumber lesions had undulate-verrucose walls and were thus evidently distinct from those found by the authors. The only other worker who mentions seeing oospores is Tanaka in 1890, but he gave no description of them. The results of the writers' investigations are considered strongly to suggest the possibility of the overwintering of the fungus in the soil.

BROWN (J. G.). **Watermelon susceptible to Texas root rot.**—*Science*, N.S., lxxviii, 2031, p. 509, 1933.

Contrary to statements that watermelons are resistant to, or immune from, Texas root rot (*Phymatotrichum omnivorum*), the writer and his colleagues have found that this plant is liable to extensive infection in Arizona, both when planted in infested soil and inoculated in the field or laboratory. In mixed cultures of *P. phymatotrichum* and *Trichoderma lignorum*, the hyphae of the former were injured or killed by the attacks of the latter [cf. *R.A.M.*, xii, p. 192].

RICHARDSON (J. K.). **Eggplant wilt.**—*Scient. Agric.*, xiv, 3, pp. 120–130, 3 pl., 1 graph, 1933.

After describing the symptoms of eggplant wilt (which has become so prevalent in southern Ontario that the crop has been largely discontinued) the author states that as all his isolations from diseased eggplants produced pseudosclerotia in culture he tentatively identifies the causal organism (the pathogenicity of which was established) as *Verticillium dahliae* [*R.A.M.*, xii, pp. 470, 494]. The fungus was obtained from all parts of the plant, including seed aseptically removed from fruits which showed severe vascular browning.

The organism grew at temperatures between 8° and 34° C. and within a P_H range of 2·3 and 9, optimum growth occurring between 21° and 24° and above P_H 5·4 [ibid., xi, p. 626]. Typical wilt was produced at soil temperatures of 11° to 30°, and none of the five varieties of eggplants studied showed appreciable resistance to the disease.

Soil applications of mercuric chloride before and after setting

out the plants gave definite control under greenhouse conditions and considerably retarded the progress of infection in the field.

The paper concludes with brief recommendations for control by seed and soil sterilization, the use of clean seed, rotation, and improved sanitary methods, and there is a bibliography of 21 titles.

FAES (H.), STAEHELIN (M.), & BOVEY (P.). **La lutte contre les ennemis de la Vigne en 1932.** [The campaign against Vine pests in 1932.]—*Ann. Agric. de la Suisse*, xxxiv, 10, pp. 1147–1159, 1933.

Owing to the low night temperature prevailing in the Lausanne district of Switzerland during May and June, 1932, the first severe outbreaks of mildew were delayed until early July; thenceforward the disease assumed a very severe form, attacking the leaves, flowering bunches, and (in the 'brown rot' phase) the fully developed fruit. Immense damage was caused in the vineyards of Valais and in certain French viticultural regions during this period of high temperatures and excessive humidity. Excellent results were again given by six applications of Bordeaux mixture at normal strength with an adhesive. Cupro-Maag (5 per cent.) [*R.A.M.*, xiii, p. 171] also proved very satisfactory, while cusisa dust [ibid., xi, p. 764] was quite efficacious; in general, however, the exclusive use of dusts in the control of downy mildew cannot be recommended under Swiss conditions. Adequate protection in the early stages of the epidemic was conferred by certain colloidal copper preparations, the effects of which, however, did not persist through July and August. An organic colouring substance known as 'hélion orange' [ibid., xi, p. 221] gave disappointing results.

The causal organism of 'coître' (*Coniothryium diplodiella*) collected in 1920 and 1921 proved to be still capable of infecting grapes in 1932 but in a distinctly attenuated form [ibid., xi, p. 692]. Encouraging results in the control of this disease were given by 1 per cent. verdet [copper acetate] and by 0·5 per cent. potassium bisulphite with 1 per cent. black soap, which reduced the incidence of infection from 81 in the control to 44 and 35 per cent., respectively, when applied 24 hours after inoculation.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, July–September, 1933. Quarantine and other official announcements.—pp. 197–243, 2 maps, 1933.

Summaries are given (pp. 218–224) of regulations governing the importation of plants into Jamaica (as brought up to 4th August, 1933); Greece (potatoes against insect pests and *Synchytrium endobioticum*, 30th September, 1933); and British Honduras (prohibiting the importation of tobacco seeds except under licence, 30th September, 1933).

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, v, 5, pp. 150–151, 155–160, 1933.

IRAQ. Customs Tariff Law No. 11 of 29th April, 1933, requires that citrus fruits and cuttings and grape vine fruit, leaves, and

cuttings destined for importation into Iraq shall be accompanied by a duly authenticated certificate from the country of origin vouching for their freedom from disease. Excepting when imported under permit for scientific research purposes, consignments of plants with woody stems and all parts thereof, cotton seeds, flower bulbs, grains, roots, and tubers (other than potato) will be subjected to inspection by agricultural officials and, in the event of disease, either disinfected or destroyed.

HOLLAND. The Flower Bulb Export Order 1932, giving effect to the Act of 31st December, 1931, and coming into force on 20th January, 1933, provides for the inspection by qualified officials of all flower bulbs destined for export from Holland with a view to determining their freedom from disease and generally satisfactory condition. The bulbs must be packed in such a way as to ensure their protection from contamination from any accompanying plants. Directions are given relative to the inspection, and to the issue and validity of phytopathological certificates.

DE HOOGH (J.). **Iepenziekte bestrijding.** [Elm disease control.] —*Nederl. Boschbouw-Tijdschr.*, vi, 11, p. 402, 1933.

An explanation is given of the Royal Decree of 26th September, 1933 (effective as from 1st October, 1933), prohibiting the piling and transport of elm logs in Holland during the flying period of the bark beetles [*Scolytus scolytus* and *S. multistriatus*], i.e., from 15th March to 1st October, with a view to preventing the dissemination of the elm disease [*Ceratostomella ulmi*: *R.A.M.*, xii, p. 737]. Exempt from this general restriction are completely decorticated wood [cf. ibid., xiii, p. 64]; material with a diameter of less than 7 cm. or originating from branches or twigs less than 7 cm. in diameter; submerged wood; and wood of which the entire bark has been treated with cabinet-maker's carbolineum or some other preparation approved by the Minister of Economic Affairs.

MALLAMAIRE (A.). **Legislative and administrative measures. French West Africa (Ivory Coast.)**—*Internat. Bull. of Plant Protect.*, vii, 12, p. 272, 1933.

A Decree of 28th July, 1933, prohibits the sale and transport in the Ivory Coast of banana suckers from plantations known to be infected by stem rot (*Marasmius stenophyllus*) [*R.A.M.*, xi, p. 97] or Panama disease (*Fusarium cubense*) [*F. oxysporum*], certificates of freedom from which, valid for three months, are required with all suckers used for sale or circulation. On any plot infested by either of these diseases the burning of affected stools on the spot in the presence of an agricultural official is compulsory, the same measure to be applied to all stools within a radius of not less than 10 m. from the centre of infection. Infested areas may not be replanted with bananas within two years.

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BRANAS (M.) & BERNON (G.). **Note sur deux cas de dépérissement et leur relation avec la présence de certains champignons dans le vieux bois de la Vigne.** [A note on two cases of wilt and their relation to the presence of certain fungi in old wood of the Vine.]—*Ann. École Nat. d'Agric. Montpellier*, N.S., xxii, 4, pp. 331–334, 1933.

An account is given of two forms of wilt affecting young vines in France. In one case the vines, growing in soil previously under lucerne for nine years, were greatly weakened and the roots much reduced; some died in 1932, more in 1933, and the vines planted to replace these in turn succumbed. Extensive black areas were present towards the inside of the vascular ring at the base of the trunk and in the roots, the lesions becoming less marked the more remote they were from the collar. The affected material contained the septate mycelium of a *Fusarium* which was demonstrated to penetrate vine roots and trunks through wounds, to be transmitted through soil, and to attack lucerne.

The second case somewhat resembled a *Verticillium* wilt, the leaves curling up, withering, and falling prematurely; the branches failed to develop properly in August, and the vines gradually died. Old vines in proximity to the affected ones contracted the infection. Internal lesions resembling those noted above were present near the collar, and a septate mycelium was observed in the affected parts. There was evidence that infection was soil-borne. Further investigations are in progress.

[This paper also appears in *Prog. Agric. et Vitic.*, c, 52, pp. 626–628, 1933.]

MANZONI (L.). **Attenti al roncet!** [Attention to roncet!]—*Battaglie Rurali*, ii, 3, p. 2, 1933.

After stating that 'roncet' or leaf roll of the vine has recently become prevalent in the province of Venice, where it was formerly almost unknown, the author describes the symptoms of the disease, which he attributes to a filterable virus and the spread of which in Italy he considers to be due to the introduction of susceptible American vines [*R.A.M.*, xii, p. 418].

The available evidence points to the existence of natural infection through the soil, though transmission to healthy vines in proximity to diseased ones was not observed [ibid., xi, p. 21].

The only method of control at present known consists in examining the mother vines regularly and systematically for the presence

of the endocellular cordons diagnostic of the condition [ibid., xiii, p. 214], destroying those that show their presence and, if the disease is quite clearly present in the soil and not merely introduced, abandoning the whole vineyard. Plantings used for reproduction should be frequently renewed on fresh soil, and American vines, such as Rupestris du Lot, should be used as little as possible.

Bosc (M.). **Action curative et adhésivité de certaines bouillies cupro-ammoniacales.** [The curative action and adhesiveness of certain cupro-ammoniacal mixtures.]—*Prog. Agric. et Vitic.*, c, 48, pp. 532–534, 1933.

Spraying tests against vine mildew (*Plasmopara*) [*viticola*] carried out since 1930 with mixtures of copper sulphate and ammonium sulphate solutions showed that the best results as regards adhesiveness, fungicidal efficiency, and freedom from scorching were given by a colloidal spray material (the adhesiveness of which was successfully demonstrated on glass and porcelain) consisting of copper sulphate and carbonate of soda, each 2 kg., and ammonium sulphate 1 to 1·5 kg. in 100 l. of water; the wetting property of this mixture was, however, improved when the proportion of copper sulphate and carbonate of soda was increased to 3 kg. The sulphate of ammonia should be as neutral as possible and preferably synthetic.

A large number of vines treated with this spray in 1933 still retained their leaves (which bore distinct traces of copper) on 1st November, although they had been very badly flooded in September.

Salmon (E. S.) & Ware (W. M.). **Department of Mycology.**—*Journ. South-Eastern Agric. Coll., Wye, Kent,* xxxiii, pp. 17–27, 1934.

From carrots bearing large, sunken, black areas, covered by the unbroken skin and showing an internal black rot, the authors isolated three fungi, including an *Alternaria* which may prove to be the radish black rot organism *A. radicina* [*R.A.M.*, ii, p. 5; ix, p. 82; xii, p. 72].

Mature ascospores of *Venturia inaequalis* were ejected from overwintered apple leaves in Kent on 9th May, and the first conspicuous attack on the new foliage was seen on 13th May. Mature conidia of *V. pirina* were found on 15th March on the spur wood and at the base of the wood buds of Louise Bonne pear trees; on the same date fallen pear leaves bore perithecia in which many asci were mature and ejecting ascospores. On 12th April the *Fusicladium* stage was present on pedicels and calyx lobes of pear blossoms and on the young leaves.

On two Kentish farms wilted Fuggles hops showed the mycelium of *Verticillium albo-atrum* [ibid., viii, p. 546] in the wood vessels in the lower portion of the bine. Fuggles cones were attacked, as in 1929, by a *Cladosporium*, the mycelium and spores of which occurred commonly on the bracts, and occasionally also on the bracteoles, producing a brown discoloration of the petals extending in lines down the cone, very similar to that caused by downy mildew [*Pseudoperonospora humuli*].

An apparently severe form of split leaf [ibid., xi, p. 744] attacked Fuggles and Golding hops, yellowish, oily spots appearing on the lamina, which was so thin that the tissue either died and turned brown or split; leaves on the main bine and on laterals were affected.

In preliminary investigations of the fungus usually known as *Xylaria vaporaria*, which forms large black sclerotia in the casing soil of mushroom beds, but does not as a rule produce spores [ibid., x, p. 8], it was found that, when experimentally induced to fructify, certain differences from the original description of *X. vaporaria* were constantly present.

BAUDYŠ (E.). **Fytopatologické poznámky VIII (za rok 1932).** [Phytopathological notes VIII (for 1932).]—*Ochrana Rostlin*, xiii, 3–4, pp. 90–102, 5 figs., 1933. [German summary.]

Continuing his seasonal notes on plant diseases in Czecho-Slovakia, the author states that mosaic diseases were again very prevalent and severe in 1932 on a number of cultivated plants [*R.A.M.*, xi, p. 424], among which a new record for south Moravia is stated to be a mosaic of tomatoes outwardly strongly recalling acute potato mosaic; the leaves on the affected plants bent down, remained stunted, turned yellow, and died. Red clover [*Trifolium pratense*] suffered widely from vein mosaic, a similar condition being also observed in dahlias. This prevalence of mosaics is attributed in part to the drought which has prevailed in the country for several years, and partly to the fact that, owing to the local agricultural crisis, the great majority of the growers are unable to fertilize adequately their lands. The same causes are believed to have been also responsible for the severe development in 1932 of other crop diseases, such as cereal rusts (*Puccinia* spp.), among which wheat black rust (*P. graminis tritici*) was particularly widespread. Feeding experiments showed that heavily rusted wheat straw did not injuriously affect cattle fed on it.

Seventh Annual Report of the Commonwealth Council for Scientific and Industrial Research for the Year ended 30th June, 1933, 87 pp. [?1933].

In the section of this report dealing with plant diseases (pp. 21–26) it is stated that during the period under review tests were conducted in Australia to determine the mode of inheritance in wheat to flag smut [*Urocystis tritici*]. The evidence obtained indicated that breeders are unlikely to secure results by testing before the F_3 generation. Segregation for reaction to the fungus occurs, but the genetic factors for resistance may differ with the variety.

Of 813 wheat varieties tested, 20 showed tolerance to *Helminthosporium sativum*; of 849 varieties, none was resistant to *Ophiobolus graminis*; and of 987 varieties, 40 were apparently resistant to *Fusarium culmorum*. Preliminary tests with the organisms causing root rots of wheat indicated that *O. graminis* and *F. culmorum* are relatively the most, and *Wojnowicia graminis* the least, pathogenic. The root and foot rot due to the combined attack of *U. tritici* and *F. culmorum* [*R.A.M.*, xiii, p. 294] caused

the death of seedlings at low temperatures when normally *F. culmorum* alone would have little effect, its optimum temperature range for disease production being from 64° to 77° F.

In the last five seasons 56 commercial tomato varieties have been found susceptible to spotted wilt [ibid., xiii, p. 333]. Early Red Dwarf showed partial resistance and is being crossed with Marglobe, Sensation, and other good commercial varieties.

During the past two years the disease of pine trees [*Pinus* spp.] known as 'needle fusion' [ibid., ii, p. 298] has been noted in South Australia, Tasmania, and New South Wales. It is most severe in coastal plantations, where 20 per cent. of the older trees are often affected. The disease is apparently infectious and is evidently more prevalent on pines growing under adverse conditions than on those growing vigorously. No organism has so far been found associated with it.

NOBLE (R. J.). **Australia: summary of plant diseases recorded in New South Wales for the season 1932–1933.**—*Internat. Bull. of Plant Protect.*, viii, 1, pp. 3–5, 1934.

Notes are given on the prevalence of disease among cereal and other field crops, fruit, vegetables, and miscellaneous plants in New South Wales during 1932–3. Collar rot of citrus (*Phytophthora parasitica*) [*R.A.M.*, xiii, p. 25] was reported and the same crop suffered from Californian dry root rot [cf. ibid., ix, p. 628]. Fig mosaic [ibid., xiii, p. 252] is widespread but generally unimportant. Pecan rosette [ibid., xiii, p. 135] was recorded for the first time. Bananas were sporadically attacked by *Armillaria mellea* [ibid., xii, p. 552]. Mosaic occurred on *Zinnia* [*elegans*: cf. ibid., xiii, p. 166] and Iceland poppy (*Papaver nudicaule*), while delphiniums were infected by bacterial leaf spot (*Bacterium delphinii*) [ibid., ix, p. 436]. Mushrooms (*Agaricus* [*Psalliota*] *campestris*) were damaged by 'bubbles' (*Mycogone perniciosa*) and the crop reduced by plaster mould (*Monilia* [*Oospora*] *fimicola*) [ibid., xiii, pp. 7, 213].

RUSSELL (T. A.). **Report of the Plant Pathologist, 1933.**—*Rept. Dept. of Agric., Bermuda, for the year 1933*, pp. 28–36, 1934.

The celery crop in Bermuda again suffered heavy damage in 1933 from blight (*Septoria apii*) [*R.A.M.*, xii, p. 421], only a small area in Southampton surviving the attacks of the fungus. A virulent source of infection was provided by the early crop, started in Canada and transplanted in Bermuda in the autumn of 1932, which was practically destroyed in the following January.

Sclerotinia sclerotiorum was observed on glasshouse cucumbers, apparently a new host for the Island. Sclerotia obtained from a rotted cabbage on 19th February developed apothecia after seven weeks under humid conditions in the laboratory, and on 1st March apothecia were found in the field. *S. sclerotiorum* is much the most important agent of decay in carrots during the winter, but causes no loss among those dug in June. No significant cultural differences were detected between isolations of the fungus from carrot, cabbage, celery, and tomato on carrot agar.

MARTYN (E. B.). **Report of the Botanical and Mycological Division for the year 1932.**—*Divisional Repts. Dept. of Agric. British Guiana for the year 1932*, pp. 117–121, 1934.

The very slow spread of mosaic on D. 625 sugar-canes in British Guiana [*R.A.M.*, x, p. 361], where no control is practised and the infected fields have been continued to the fourth and fifth ratoons, in spite of which good yields have been maintained, indicates that this variety is definitely resistant.

The fungus associated with the disease known locally as 'man rice' [ibid., xii, p. 11] was identified at the Imperial Mycological Institute as a strain of *Fusarium moniliforme* [*Gibberella moniliformis*]; the 2- to 4-, mostly 3-septate macrospores measured 26·4 to 49·5 by 3·3 to 4·9 μ, and the non-septate microspores 6·6 to 13·2 by 3·3 to 4·9 μ, these measurements agreeing fairly well with those of the organism causing a similar but more severe disease in Madras [ibid., x, p. 336; xii, p. 266] and with those of the conidia of *Lisea* [*G.*] *fujikuroi*, causing 'bakanae' disease in Japan [ibid., xiii, p. 323].

From the diseased inflorescences of Demerara Creole rice affected by a spotting on the paleae, which turned brown or black, the whole spikelet drying up, the author isolated *Acrothecium lunatum*, which causes a similar disease of rice on the Gold Coast [ibid., vi, p. 144]. A *Fusarium* and *Clasterosporium punctiforme* were also obtained from the diseased inflorescences.

Liberian coffee from Demerara was affected with phloem necrosis [*Phytomonas leptovasorum*: ibid., xiii, p. 28]; until recently, only isolated bushes were attacked in British Guiana, but in 1932 a more extensive outbreak occurred in the North West District.

Papaw seedlings were affected by a disease resembling curly leaf [ibid., x, p. 810].

Division of Botany.—*Fifty-second Ann. Rept. New York (Geneva) Agric. Exper. Stat. for the year ended June 30, 1933*, pp. 27–42, 1934.

In further studies of raspberry diseases conducted at Geneva, New York, on a group of red raspberry seedlings [*Rubus idaeus*] of varying parentage after four seasons' spread of mosaic diseases, it was found that Cuthbert as a parent contributed susceptibility to red mosaic [*R.A.M.*, xii, p. 770] to a greater degree than any other parent represented. The June and Marlboro varieties also contributed susceptibility to red mosaic. Used as parents these three varieties also contributed a lack of 'klendusity' [ibid., xiii, p. 249] to red mosaic, while the Newman-Herbert crosses showed the highest degree of this quality. Injury from this disease can be much reduced if high vigour is maintained in a planting of resistant varieties. Mosaic-free stocks of the resistant red variety Latham and the black [*R. occidentalis*] variety Cumberland, and trial plantings of the new mosaic-escaping red variety Newburgh [ibid., xii, p. 204] are recommended for use. Susceptible varieties lacking klendusity cannot be protected by isolation and roguing where such high rates of spread prevail as in the Hudson Valley.

In the western parts of New York wild red raspberries are commonly affected with mosaic and serve to infect healthy cultivated

stock; wild black raspberries and wild blackberries [*R.* spp.] do not, however, appear to be serious sources of infection.

Inoculation experiments demonstrated that the mild mottling universally present on Columbian purple raspberries [*R. neglectus*: ibid., vii, p. 36] is an expression of red raspberry mosaic, the red mosaic virus not being in the least attenuated or weakened by existence in the resistant Columbian host.

Anthracnose [*Plectodiscella veneta*: ibid., xii, p. 456] causes damage in most plantings of black and purple raspberries in western New York; an annual delayed dormant spray with lime-sulphur (1 in 10) is recommended for control.

Leaf mould of tomatoes [*Cladosporium fulvum*: ibid., xiii, p. 134] was observed to be present in field crops, though usually confined to the greenhouse in New York State.

Spraying tests against apple scab [*Venturia inaequalis*: ibid., xi, p. 788; xii, p. 204] indicated that lime-sulphur should be used until blossoming but the advisability of using it subsequently depends on the severity of the infection, orchard practices, and individual factors. Wettable sulphurs, such as flotation sulphurs, dry-mix, and kolofog, are in general safe substitutes for liquid lime-sulphur, though the last-named is the only spray recommended for use after infection periods or where the disease is established. An effective strength for lime-sulphur in the conditions prevailing in the Hudson Valley would appear to be 1 in 60; considerable evidence showed that the formula for dry-mix may be safely reduced from 16–8–½ to about 10–3–½. Extensive tests indicated that dusts, wettable sulphur, or Bordeaux mixture (2–6–100) may safely be applied to apples during bloom; varieties differed, however, in the percentage of fruit set with this practice.

In the Hudson Valley many factors, any of which may be a limiting factor, may be concerned in the production of fungicidal injuries in apple orchards. Some orchards are highly susceptible, regardless of the variety grown. Dry lime-sulphur caused less injury than the liquid form, but the wettable sulphurs gave the best results in this respect. Cal-mo-sul [ibid., x, p. 224] markedly reduced the copper injury in Bordeaux mixture, but not enough for calyx applications.

Ceresan when applied to moist wheat seed commonly caused abnormal germination, at least 50 per cent. of the seeds being so weakened that the seedlings consisted of short, clubbed roots and plumules; the injury is attributed to the dusting of the seed when damp and to improper storage (especially of chipped or cracked seed) after treatment.

A form of *Ustilago tritici* obtained from W. F. Hanna at Winnipeg [ibid., xi, p. 443] produced no infection on Honor wheat but caused heavy infection on the Reward variety inoculated at the same time. On the other hand, a form collected in New York on Honor produced heavy infection on the same variety, but none on Reward.

Division of Plant Pathology.—*Forty-third Ann. Rept. Washington Agric. Exper. Stat. for the fiscal year ended June 30, 1933* (*Bull.* 291), pp. 42–44, 1934.

Further studies have been conducted by F. D. Heald, E. F.

Gaines, and C. S. Holton on physiologic specialization in *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*: *R.A.M.*, xii, p. 204], and a monograph on the present status of the bunt problem is in preparation.

The storage rot of apples caused by blue mould [*Penicillium expansum*] has continued to engage the attention of F. D. Heald and K. Baker [ibid., xii, p. 574].

Brown rot of sour cherries (*Sclerotinia cinerea* [forma] *pruni*) [ibid., xiii, p. 33] caused severe blossom blight, followed by almost complete killing of the fruit spurs. Western yellow rust (*Phragmidium imitans*) [ibid., xii, p. 678], succeeded by cane blight (*Leptosphaeria coniothyrium*) [ibid., xiii, p. 174], did unusual damage to raspberries.

GUERRERO (J.). **Report of the Assistant in Agronomy and Horticulture.**—*Rept. Guam Agric. Exper. Stat., 1930–31, 1931–32*, pp. 11–20, 2 figs., 1933. [Received March, 1934.]

The following items of phytopathological interest occur in this report. The best control of citrus scaly bark (psorosis) [*R.A.M.*, xiii, p. 90] and gummosis has been obtained by thoroughly scraping the infected areas with a knife, disinfecting the wounds with bichloride of mercury (1 in 500 in a 25 per cent. aqueous solution of ethyl alcohol), and applying a weak solution of carbolineum. In the event of reinfection, the wounds should again be scraped and coated with a paste made by mixing either calcium carbide residue or lime with the carbolineum.

Sclerotium rolfsii caused a heavy reduction of the tomato crop on experimental breeding plots.

Report of Mr. F. Stell, Mycologist, Department of Agriculture, on his visit to Ecuador to study witchbroom disease (Marasmius perniciosus) of Cocoa.—*Trinidad and Tobago Council Paper No. 137 of 1933*, 12 pp., 1 map, 1 graph, 1934.

Witches' broom of cacao (*Marasmius perniciosus*) [*R.A.M.*, xii, pp. 143, 522] was first discovered in Ecuador in 1921 in the Balao district, where it spread so rapidly that in 1933 all the plantations inspected by the author were heavily infected, with many fallen twigs and pods bearing numerous sporophores. All attempts at control having failed, general maintenance work had been largely curtailed and many estates abandoned. On three estates where the yields in 1921 had amounted, respectively, to 11,000, 8,000, and 5,100 quintals they had fallen in 1932 to 850, 1,600, and 200 quintals, while three others which in the former year yielded, respectively, 30,628, 11,078, and 4,067 quintals, in 1925 yielded 883, 81, and 3 quintals only.

In 1923, one very healthy tree, of the 'Cojon de Toro' or 'Calabacillo' type (classified by Van Hall as a Forastero cacao), was found among thousands heavily infected; transplants proved to be almost immune, but owing to the poor quality of the produce the planting of this type of cacao was not extended on a large scale. In 1924, another tree, an importation from Venezuela of a type known in Ecuador as 'Zambo' (a sub-variety of Forastero), was found to be immune, though the progeny are attacked to some

extent. In this case also the pods were of poor quality. Later, another variety, which has been termed No. 5 and is, apparently, not mentioned in cacao literature, was found to be highly resistant and to give a crop of much better quality. A fourth type showing resistance is known as Soconusco; this variety gives the best produce of the resistant types so far encountered.

A million transplants from seed of different resistant types were completed in one group of plantations in 1933, and the oldest plants, which are six to seven years old, have shown very high resistance to *M. perniciosus*; the yield of pods is at least three times that of the old plantations.

On one large estate about 80 per cent. of 500 seedlings of a strain known locally as 'Venezuela Nacional', derived from several trees that had been observed to show resistance, showed marked resistance; a 4,000-tree block was established from this strain and a large majority of the trees, now five years old, still maintain a high degree of resistance.

The *Monilia* disease of cacao [*M. roreri*: ibid., xiii, p. 292] is probably indigenous to Ecuador, as it has been found there on wild cacao (*Theobroma bicolor* and *T. balaensis*) and is unknown elsewhere. Only the pods are attacked, the vegetative tissues being apparently immune. When affected, the small pods develop a slight protuberance or become discoloured, and greyish veins are visible on the cut surface; diseased pods are heavier than healthy ones of equal size and are difficult to cut, the interior layer of the shell being hard. The shell itself, when cut, shows black or yellowish zones and sometimes small water cavities or areas surrounded by a well-defined yellowish line. The seeds of affected pods are useless. Infection is most serious near the Andes, where in some localities 95 per cent. of the pods are worthless.

An extract from a report on the *Monilia* disease by J. B. Rorer is appended, and a map, which also indicates rainfall, is given of the cacao areas of Ecuador.

Die wichtigsten starken Schäden an Getreide im Jahre 1933. [The principal severe damage to cereals in the year 1933.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 1, pp. 3–4, 2 maps, 1934.

Notes are given on the prevalence of a number of well-known fungous diseases and insect pests of cereals in Germany during 1933, the distribution and incidence of barley stripe (*Helminthosporium gramineum*) and the foot rots (*Leptosphaeria herpotrichoides*, *Ophiobolus herpotrichus*, and *Fusarium* spp., chiefly affecting wheat) [*R.A.M.*, xiii, p. 154] being shown by maps.

PETIT (A.). **Résultats expérimentaux sur la préservation des céréales contre les parasites cryptogamiques en Tunisie.** [Experimental results on the protection of cereals against cryptogamic parasites in Tunis.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 6–7, pp. 210–260, 1933. [Received March, 1934.]

The author describes in detail the results of his tests of a very large number of chemical compounds for the seed treatment of cereal diseases, attention being paid in particular to toxicity to

spores present on the seed, preservation of germinability, and protection against soil-borne organisms and insects. He concludes that *Urocystis tritici*, *Tilletia levis* [*T. foetens*], and *T. tritici* [*T. caries*] on wheat, *Ustilago hordei* on barley, and *U. avenae* on oats can be satisfactorily checked by seed disinfection with certain dusts containing copper, the best for general efficiency being copper arsenite. Against loose smut of wheat (*U. tritici*) the hot water treatment alone is effective. Against the rusts *Puccinia glumarum* and *P. triticina* the selection of resistant varieties of wheat appears to be the most fruitful method of control.

McDonald (J.). **Two new records of physiologic forms of Wheat-stem rust in Kenya colony.**—*Trans. Brit. Mycol. Soc.*, xviii, 3, pp. 218–222, 1933.

In this brief note the author records the occurrence in Kenya of two additional physiologic forms of wheat black rust (*Puccinia graminis tritici*) [*R.A.M.*, x, p. 507; xiii, p. 217], namely, form K3 and form K4. The reaction to inoculation of certain American differential host varieties [the details of which are briefly described and discussed] indicated the probability that form K3 is identical with the American form 34 [ibid., xii, p. 556], while K4 exhibited a close general similarity to form 116, produced artificially in Canada by hybridization [ibid., xii, p. 14].

Milan (A.). **Delle infezioni per 'Ustilago tritici' (Pers.) Jens. e di una facile procedura per ottenerle artificialmente.** [On infections by *Ustilago tritici* (Pers.) Jens. and an easy method of obtaining them artificially.]—*Nuovo Giorn. Bot. Ital.*, N.S., xl, 4, pp. 539–547, 1 pl., 1933. [Received April, 1934.]

A simple method devised by the author for inoculating large numbers of wheat plants at a time with *Ustilago tritici* consists in removing the middle florets from each spikelet, together with the end spikelets, the glumes of the remaining florets and finally the anthers, afterwards sprinkling the plants with the spores at intervals. Used to inoculate wheat of several varieties in pots, boxes, and the field, this method gave 95 to 100 per cent. infection. It may very conveniently be used in genetical studies, as it renders possible simultaneous hybridization and inoculation on a large scale.

Briggs (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in Sherman and Oro Wheat hybrids.**—*Genetics*, xix, 1, pp. 73–82, 3 graphs, 1934.

Data are presented showing that the Sherman and Oro hybrid wheat varieties differ from the susceptible Baart in one major factor for resistance to bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xii, p. 84]. In Sherman this factor was identified as the Martin factor (the genetic constitution may be expressed *MM hh tt*), which also governs the reaction of Martin, White Odessa, Banner Berkeley, and Odessa, while in Oro the resistant factor was found to be identical with the Turkey factor (*mm hh TT*), also operating in Turkey 1558 and 3055 [ibid., xiii, p. 20]. Hussar and selections 1418 and 1403 from Hussar × Hard Federation are governed,

respectively, by the Martin and Hussar factors (*MM HH tt*) and the Hussar factor alone (*mm HH tt*).

The results of other workers on the inheritance of resistance to bunt are analysed [cf. ibid., xi, pp. 33; xii, pp. 17, 85, *et passim*], and in this connexion the desirability is suggested of further genetic studies on resistant varieties, and of the accumulation of more data on physiologic forms of *T. caries*, care being taken to use pure lines.

BROADFOOT (W. C.). **Studies on foot and root rot of Wheat. III. Effect of crop rotation and cultural practice on the development of foot rot of Wheat.**—*Canadian Journ. of Res.*, x, 1, pp. 95–114, 2 diags., 1934.

Further observations [details of which are given] made between 1928 and 1932 over a wide range of soil and climatic conditions in western Canada on the foot and root rots of wheat primarily associated with *Helminthosporium sativum* and *Fusarium* spp. [*R.A.M.*, xii, p. 684] showed that, under the experimental conditions which closely approximated to ordinary farm practice, there was a marked decrease in the incidence of the disease accompanied by an increase of yield where wheat followed summer fallow. The degree of infection ('infection rating') was determined by a statistical method in which the conditions of the crown and secondary roots was used to furnish a numerical basis. This was supplemented by the determination of the total number of culms, number of fertile culms, and yield. No additional benefit was derived from extending the period of summer fallow from one to two years. An oat crop in place of the fallow was equally effective, and here again one crop was sufficient. Two crops of sweet clover [*Melilotus alba*] preceding wheat acted similarly on the latter to one of oats or summer fallow. Foot rot was found to be less prevalent in late- than in early-sown wheat.

BROADFOOT (W. C.). **Studies on foot and root rot of Wheat. IV. Effect of crop rotation and cultural practice on the relative prevalence of Helminthosporium sativum and Fusarium spp. as indicated by isolations from Wheat plants.**—*Canadian Journ. of Res.*, x, 1, pp. 115–124, 1934.

The crown and root tissues of 43,305 out of 47,360 wheat plants examined in the course of the writer's studies on foot and root rot in western Canada [see preceding abstract] yielded *Helminthosporium sativum*, *Fusarium culmorum*, and *F.* spp., with or without other fungi, including *Wojnowicia graminis* [*R.A.M.*, xiii, p. 295] and *Ascochyta graminicola*. None of the various crop sequences or cultural practices employed in this series of experiments appeared to affect significantly the relative prevalence either of *H. sativum* or *F.* spp. in the crown tissue. It was inferred, however, from the marked tendency to predominance of one or other of these organisms at certain stations each year, that environmental factors are of importance in determining their relative incidence.

CHRISTENSEN (J. J.) & STAKMAN (E. C.). **Fungi and bacteria on Barley.**—Abs. in *Phytopath.*, xxiv, 1, pp. 4–5, 1934.

Many of the 200 isolants from eight genera of fungi inoculated into barley plants at the Minnesota Agricultural Experiment Station caused leaf and sheath lesions and kernel discolorations. Secondary invasions, especially by *Alternaria* spp., were common, and several bacteria were also found to be pathogenic. Fungi representing over 20 genera were isolated from some 500 samples of barley seed. In 1932 *Fusarium* and *Helminthosporium* spp. were responsible for about 50 per cent. of the shrivelling and discoloration of the kernels, and in 1933 for approximately 30 per cent., the latter being the more prevalent of the two genera in both seasons. Good results were obtained by seed treatment with ceresan.

GORDON (W. L.). **A study of the relation of environment to the development of the uredinial and telial stages of the physiologic forms of Puccinia graminis avenae Erikss. and Henn.**—*Scient. Agric.*, xiv, 4, pp. 184–237, 5 pl., 16 diags., 2 graphs, 1 map, 1933.

In this paper a detailed account is given of further studies in Canada of nine physiologic forms of oat stem rust (*Puccinia graminis avenae*) [*R.A.M.*, xii, p. 280], with special reference to the relation of environmental factors to the development of the uredo and teleuto stages. The results obtained [which are tabulated, expressed graphically, and fully discussed with numerous references to the relevant literature] may be briefly summarized as follows.

The temperature (12° to 28° C.) at which Victory, White Russian, and Richland oats were grown before inoculation of the seedlings had no appreciable effect on the types of uredo infection produced by forms 1 to 9 [ibid., x, p. 176]. At 12° Joanette Strain was resistant to forms 1, 3, 4, and 5, while at 28° it was completely susceptible to all nine forms. Only at low temperatures did forms 1, 3, 4, and 5 produce characteristic infection on Joanette Strain. As certain forms can only be separated from one another by the reaction to them of this variety and then only at low temperatures which may be inconvenient in practice, the following grouping is suggested: group I, forms 1, 2, and 5, group II, forms 3 and 7, group III, forms 4 and 6. The forms comprising each group differ only in the types of uredo infection which they produce on Joanette Strain at a relatively low temperature. There is very little difference between forms 1 and 5 at all temperatures, and at relatively high temperatures forms 3 and 7 are indistinguishable. Forms 8 and 9 are identifiable under ordinary greenhouse conditions.

Both on seedlings and mature plants all the physiologic forms developed teleutospores more rapidly at 24° to 28° than at 12° to 16°. Forms 3, 4, 6, 7, 8, and 9 produced teleutospores much more rapidly than forms 1, 2, and 5; as the former group is the more virulent, there appears to be a correlation between pathogenicity and rapidity of teleutospore formation.

The rarity of forms 3, 4, 6, 7, 8, and 9 in Canada may be due to

the early development of teleutospores, the period of uredospore production being curtailed and the amount of inoculum diminished. Further, teleutospores formed in hot weather may not be germinable.

The stage of development reached by the host was not a limiting factor in the production of teleutospores by any of the forms.

A relative atmospheric humidity of 80 per cent. increased the extent and rate of teleutospore development on oat seedlings, and one of 40 per cent. slightly increased the rate on mature plants.

Ultra-violet radiation had no significant effect on uredospore or teleutospore formation [ibid., viii, p. 516; xi, p. 563].

NICOLAISEN (W.). **Die Grundlagen der Immunitätszüchtung gegen Ustilago avenae (Pers.) Jens.** [The bases of breeding for immunity from *Ustilago avenae* (Pers.) Jens.]—*Zeitschr. für Züchtung*, A, xix, 1, pp. 1–56, 1934.

A comprehensive, fully tabulated account, supplemented by a bibliography of 212 titles, is given of the writer's continued investigations (1930–2) at the Halle University Agricultural and Plant Breeding Institute on the fundamental aspects of breeding and selection for immunity from loose smut of oats (*Ustilago avenae*) [*R.A.M.*, xiii, p. 318], in which nearly 150,000 plants were inoculated with spores and at least 34,000 with mycelium. Reed's method [ibid., ix, p. 102] gave further proof of its superiority to any other standard technique for experimental work on breeding for oat smut immunity.

The actual occurrence of smutted panicles is the criterion whereby reaction to *U. avenae* should be gauged, 'latent infection' [ibid., xii, p. 209] being only of theoretical importance in this connexion. The number of resistant oat types is narrowly limited by the existence of many physiologic strains of loose smut. However, the synthetic development of selections immune from all the physiologic strains of *U. avenae* may ultimately be realized on the basis of a knowledge of the heritable specific resistance to a given strain. Within the species *A. sativa* and *A. byzantina* are varieties suitable for hybridization with this end in view.

A summary is given of the knowledge at present available on sex and cytology in *U. avenae* [ibid., xii, p. 17]. In connexion with the genetic analysis of mono- and bikaryotic cultures of *U. avenae* in relation to their virulence on the test plants, it was necessary to devise a reliable method of inoculation with sporidia or mycelia. Dehulled oat seeds were laid with the embryo downwards on an agar culture at 20° C. After four days, when the embryo has attained a length of 1 to 2 cm. and an adequate root system is formed, the seed and a fragment of the culture are placed on soil in a clay dish, covered with pure sand, and again maintained at 20° until germination and subsequent transplanting. Up to 100 per cent. infection was secured on susceptible varieties by this method. The results of these tests confirmed previous observations as to the inability of monosporidial cultures to cause infection [ibid., xi, p. 37]. Marked differences in growth habit were shown by the haploid monosporidial cultures, indicating that a given

smut collection consists of a population of morphologically distinct, mostly heterozygotic biotypes [cf. ibid., viii, p. 298; x, p. 444]. Similarly it was shown that wide variations in pathogenicity characterize the biotypes of a given collection. By means of crosses between sporidia from spores of varying known pathogenicity it was ascertained that the inheritance of pathogenicity is dominant in respect to the Gopher variety, recessive with von Lochow, and mixed dominant and recessive with Lischow. Combinations were developed by segregation that failed to infect even the highly susceptible oat strain 01108. The mode of inheritance in *U. avenae* denotes that the selective action of different oat varieties is conditioned, not only by their specific resistance to the pathogen, but also by the transmission of virulence from one generation of the latter to the next. New physiologic forms may arise through the crossing of those already in existence, and in the interests of breeding for resistance the development of every possible new combination among the collections in Germany or neighbouring countries should be encouraged. It is not desirable, however, at any rate in the immediate future, to extend these attempts to forms from distant countries, the multiplication of which should be subject to stringent precautions. Seed-grain disinfection should immediately be applied at the first sign of disease in a hitherto immune stand.

M'KAY (R.). **The incidence and control of loose smut and leaf spot of Oats.**—*Journ. Dept. Agric. Irish Free State*, xxxii, 2, pp. 234–256, 1933. [Received April, 1934.]

An investigation into the seed-borne diseases of oats in the Irish Free State showed that the commonest smut is *Ustilago avenae* and the most prevalent and injurious disease the leaf spot due to *Helminthosporium avenae* [cf. *R.A.M.*, xiii, p. 89]; *U. kolleri* occurs occasionally, and the presence of halo blight (*Bacterium coronafaciens*) was established for the first time in circumstances which indicated that it had been introduced on seed from Germany.

In three localities *U. avenae* was completely controlled by seed disinfection with formalin spray (50 per cent., used at the rate of 1 qt. to 50 bushels of seed) or formalin sprinkle (1 in 320, 40 galls. to 50 bushels). It was ascertained that the chief factors reducing loose smut infection locally were very moist soil, the presence of hulls on the seed, and in some cases shallow sowing. In field tests ceresan and abavit B reduced the initial amount of infection by *H. avenae* to under 0·5 per cent., increased the number of plants per unit area by 22 to 25 per cent., and generally improved the vigour of the crop. Neither dust injured germination and both were superior to formalin for the control of leaf spot.

DENNIS (R. W. G.). **Studies in the morphology and biology of Helminthosporium avenae.**—*Trans. Brit. Mycol. Soc.*, xviii, 3, pp. 223–238, 4 pl., 1 fig., 1 graph, 1933.

This is a somewhat condensed account of the author's studies of the leaf stripe disease of oats (*Helminthosporium avenae*) in

Scotland, a full report of which has already been noticed from another source [*R.A.M.*, xiii, p. 158].

YU (T. F.). **Studies on Helminthosporium leaf spot of Maize.**—*Sinensia (Contr. Metrop. Mus. Nat. Hist. Acad. Sinica)*, iii, 11, pp. 273–318, 4 pl., 1933.

A fully tabulated account is given of the writer's studies on the leaf spot of maize caused by *Ophiobolus heterostrophus* in its conidial stage *Helminthosporium maydis* [*R.A.M.*, x, p. 305], which was found in a two-year survey of the Nanking district of China on over 90 per cent. of the crop. The most conspicuous spots occur on the leaf blades, on which they are brown, fusiform, or elliptical, and 15·3 by 2·4 mm. in diameter. Wounded ears, leaf midribs, and stems may occasionally contract infection. *O. heterostrophus* can be grown on a number of standard media, but in these experiments perithecia (immature) were formed only on sterile maize and sorghum leaves at 27° to 33° C. The optimum temperature for conidial germination was found to lie between 26° and 32°. The conidia remain viable for a month on slides and for over a year on seeds in the laboratory; they also germinated after 16 months in agar tubes or 8 months on maize leaves. Both conidia and mycelium survive the winter when buried in soil in the open field. Wind and rain are the chief agencies in the dissemination of conidia in the field. Maize plants may be attacked at any stage of development. None of the other 35 Gramineae inoculated with *O. heterostrophus* proved susceptible.

READ (J. W.). **Destroying mold spores on bread by ultra-violet radiation.**—*Cereal Chem.*, xi, 1, pp. 80–85, 1934.

Freshly baked bread was heavily inoculated at the W. E. Long Company Research Laboratories, Chicago, with spores of common species of *Aspergillus*, *Penicillium*, *Rhizopus*, and *Mucor* [*R.A.M.*, xii, p. 757] and exposed for varying periods at given distances to ultra-violet radiation from three types of mercury vapour lamps and from the open C4 type of carbon lamp [cf. ibid., xi, p. 710]. After treatment the loaves were wrapped in sterile waxed paper and incubated at 93° to 95° F. Only one of the mercury vapour lamps proved to be effective against the moulds used in the tests, namely, the Uviarc with General Electric No. 10 burner, operated at 220 volts and 5 amperes, exposure to which for one minute at a distance of 6 in. generally caused the complete destruction of all the spores. For commercial purposes, however the 'C' carbon lamp, containing a mixture of iron, nickel, aluminium, and other materials in the core, is more advantageous, the lethal rays from this source destroying heavy spore infection in 45 seconds at a distance of 8 in., operating on direct current at 75 amperes and 60 volts. The rays were found to traverse the transparent sheeting (cellophane and 'sylphwrap') used for wrapping the loaves without diminution of fungicidal potency. This process of sterilization is now being successfully employed on a limited commercial scale to prevent the development of mould on certain special dietary products, such as 'Proteo' bread.

NARASIMHAN (M. J.) & MAYNE (W. W.). **Report on the disease situation in Coffee areas in 1933.**—*Planters' Chron.*, xxviii, 26, pp. 585–590, 1933.

Observations made in 1933 failed to confirm the view [*R.A.M.*, xi, p. 368] that coffee die-back in southern India is a secondary condition following severe infection by leaf disease [*Hemileia vastatrix*] or, occasionally, other debilitating factors. Infection by *Colletotrichum* [*coffeanum*] and blackening of the shoot tissue occurred in shoots bearing a number of pairs of leaves, thus indicating that defoliation is not of prime importance as a predisposing cause. Further, in several localities no evidence could be obtained that infection by *H. vastatrix* was more severe during the period preceding the exceptionally severe outbreak of die-back in 1933 than it had been in other years. It is considered possible that in 1933 a parasitic strain of the *Colletotrichum* encountered highly favourable climatic conditions, with the result that it destroyed large numbers of young shoots.

In other years spray applications against *H. vastatrix* [ibid., xiii, p. 229] have reduced die-back to negligible proportions, but in the season under review the results were considerably less successful than usual, though in some districts the control was very satisfactory. The conclusion suggested by the data is that where poor control followed spraying it was due not to any failure in the protective power of the spray, but to a greater intensity of die-back in the period preceding spraying.

No evidence was forthcoming that die-back is caused by water-logging, many severely attacked areas being well drained while other, badly drained localities did not suffer more than the rest. No close correspondence was observed between soil or topographical features and die-back incidence, neither did observations on a number of estates indicate that the disease was associated with any particular shade tree.

The severity of the attacks experienced in 1933 is attributed to the early onset of 'blossom showers' and to continued showery weather up to the beginning of the south-west monsoon, which was early; similar climatic conditions were also associated with severe outbreaks in 1923 and 1928. The widely varying results given by spraying are attributed to the considerable development of die-back that occurred before spraying in some cases, and to the abundant production of unprotected growth after spraying in others. Excluding these conditions, the degree of control given by spraying was not clearly related to the time of application.

STAHEL (G.). **De tegenwoordige stand van het onderzoek naar den overdrager der zeefvatenziekte van de Koffie.** [The present status of the investigation on the vector of phloem necrosis of Coffee.]—*Landbouwproefstat. Suriname Meded.* 7, 9 pp., 1934.

In connexion with the writer's researches on the insect vectors of the flagellates [*Phytomonas leptovasorum*] associated with phloem necrosis of coffee in Surinam [see above, p. 357], details are given of experiments indicating that *Lincus* bugs (*L.* (?) *securiger*)

may be concerned in the process of transmission. The food canal of these insects measures 4 μ in diameter and is thus amply wide enough to accommodate the largest coffee flagellates [ibid., xii, p. 435]. Bugs are known to transmit the latex flagellates of *Euphorbia* and *Asclepias* spp. [cf. ibid., vi, p. 437], and it seems probable that they serve a similar purpose in phloem necrosis of coffee. This line of investigation is being pursued.

Reports received from Experimental Stations, 1932–1933.— 234 pp., 2 figs., 22 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1934.

This compilation of reports for the season 1932–3 received from various cotton-growing stations in the British Empire [cf. *R.A.M.*, xii, p. 438] contains, among others, the following items of phytopathological interest.

Investigation of the insect vectors of internal boll disease (*Nematospora gossypii* and *N. coryli*) in South Africa showed that *Dysdercus nigrofasciatus* appears before *D. fasciatus* or *D. intermedius*. By far the most important local wild hosts of these vectors are *Adansonia digitata* and two species of *Sterculia*. Evidence was obtained that, owing to the mechanical difficulty of obtaining food from bolls sufficiently advanced to provide proper nutrition, nymphs which have not reached the fourth instar are not efficient vectors of the disease. Early in the season staining is largely due to bacterial agency, but later on it is more definitely caused by *Nematospora*. Locally, *N. gossypii* is more abundant than *N. coryli*, and is transmitted by all three species of *Dysdercus*. Adults of *D. nigrofasciatus* collected from wild cotton and from *Hibiscus vitifolius* in November and December, as well as adults of *D. intermedius* collected from *S. rogersii* in the same months and from *Hibiscus* sp. in January, all carried *N. gossypii*; apparently, therefore, migrants to the crop are already infected with the fungus. Infection spreads more rapidly in bolls which have passed the stage of rapid growth and in which the lint is thickening than in young, rapidly growing bolls or older bolls beginning to mature and dry out. With neither fungus does the staining extend beyond the loculus where infection starts, and *Nematospora* is not present in the seed unless the latter has been directly punctured by the insects. *N. gossypii* and *N. coryli* vary considerably in virulence. In the early stages of infection by *N. coryli* the stained region approximates to that occupied by the fungus. The influence of *N. gossypii*, however, extends far beyond the region it occupies (limited to the immediate neighbourhood of the puncture) and causes extensive breakdown and matting of the lint. The spread of the staining beyond the region occupied by the fungus suggests that the death of the lint hairs is due to the liberation of a toxin, and bolls inoculated with a sterilized, centrifuged suspension of a pure culture of either fungus developed staining indistinguishable from that produced by the living organism, this effect being much more marked with *N. gossypii* than with *N. coryli*.

At Shambat (Sudan) X. 1530 (a selection from the Sakel main crop) and X.H. 1229 (a fixed hybrid between Sakel and Sea Island cotton) reached the final stage of propagation; in recent years

both have given a satisfactory yield and shown a high resistance to leaf curl, the latter being maintained in all the tests in 1932 [ibid., xii, p. 439]. The propagation of X. 1530 was continued on as large a scale as the available seed would allow, as it is intended to replace the Egyptian Sakel type with X. 1530 throughout the Gezira area; it is not, however, resistant to blackarm [*Bacterium malvacearum*].

In breeding tests in Uganda the best new selections were families of B. 31, the strain most resistant to blackarm; B. 37 and several U. 4 derivatives also gave satisfaction. The best pedigree line was a U. 4.4.2 derivative (B.P. 38/32), which gave a high yield and was very resistant to blackarm.

Experiments in St. Vincent showed that the red plant body of the perennial Peruvian type cotton, Trinidad Red Kidney, which is inherited by some of the progeny of this variety crossed with Sea Island Crinkled Dwarf and of these hybrids back-crossed to Sea Island, is correlated with apparent immunity from angular leaf spot [*Bact. malvacearum*: ibid., xi, p. 699], no infection having been noted on the strains of Sea Island type pure for red body for two years, though adjacent rows of other strains were attacked.

VASSILIEFF (A. A.). „Увядание" лубяных культур в условиях Средней Азии. ['Wilt' of cultivated bast-yielding plants under Central Asian conditions.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 22–24, Новлубинст. ВАСХНИЛ. [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

The results of experiments in 1932 in the neighbourhood of Namangan [Turkestan] to determine the host range of *Verticillium dahliae* (stated to be the cause of a serious wilt of cotton in Russian Central Asia) [cf. *R.A.M.*, xi, p. 41; xii, p. 470] showed that, when sown in plots which previously bore severely infected cotton plants, sesame [*Sesamum indicum*], okra [*Hibiscus esculentus*], soy-beans, hemp [*Cannabis sativa*], and American jute [*Abutilon avicennae*] were infected to the extent of 19·3, 85 to 93·5, 42·6, 24·2, and 98·2 to 100 per cent., respectively. The outward symptoms of the disease on these hosts were similar to those on cotton, but internally it was noticed that while in cotton the internal mycelium was strictly confined to the vascular bundles in the stem, from which it did not emerge (except at wounds involving the vessels) even when cut cotton stems were kept for a long time in a moist chamber, in okra and *A. avicennae* the mycelium often grew out through the walls and penetrated, both inter- and intra-cellularly, to the pith. In jute [*Corchorus capsularis*], which was also infected by the wilt, the mycelium passed from the vessels but did not extend beyond one or two cells.

Isolations from the wilted plants mostly yielded *V. dahliae*, which was culturally identical with the strain isolated from cotton; the latter was successfully inoculated into the other hosts through wounds.

A careful selection of rotation crops is evidently necessary in infected land. *V. dahliae* may well be also parasitic on a wide range of weeds.

SZILVINYI (A. v.). **Blastodendrion canis nov. sp.; ein Beitrag zur Diagnose und Systematik der asporogenen Sprosspilze.** [*Blastodendrion canis* nov. sp.; a contribution to the diagnosis and systematic grouping of the asporogenous budding fungi.] —*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 13–16, pp. 284–299, 2 figs., 1933.

Based on the classification systems of Janke (Allgemeine technische Mikrobiologie. I. Dresden und Leipzig (Steinkopf), 1924) and of Ciferri and Redaelli [*R.A.M.*, xiii, p. 186], the writer proposes a fresh grouping of the family Torulopsidaceae, revised in the light of recent studies and satisfying both botanical and medical requirements. Essentials for inclusion among the asporogenous budding fungi [a key to which is given] are the absence, not only of a perfect stage, but also of a true mycelium. The family is divided into two tribes, Torulopsideae with short sprouting cells and Mycotoruleae with long ones (pseudohyphae). To the former belong *Klöckera*, *Torulopsis*, and *Pityrosporum*, and to the latter *Mycotorula*, *Mycoderma*, *Pseudomycoderma*, *Pseudomonilia*, and *Blastodendrion*.

In this connexion details are given of an uncommonly variable representative of the last-mentioned genus, *B. canis* n. sp., which was isolated from a Chinese pet dog suffering from dermatitis whose owner was similarly affected. The organism [a Latin diagnosis of which is given] is characterized by round, elliptical, or occasionally rod-shaped cells, varying in size from 2·42 to 7·67 by 1·98 to 2·8 μ, according to the substratum, containing oil drops at maturity, forming white to yellowish, slightly raised colonies, with somewhat sinuous or rugose margins, and not fermenting sugars.

LAMB (J. H.) & LAMB (MARGARET L.). **Precipitin and fermentation reactions of the Moniliae.**—*Proc. Soc. Exper. Biol. and Med.*, xxxi, 3, pp. 371–373, 1933.

On the basis both of their precipitin and fermentation reactions [which are briefly described], a number of Moniliae isolated from cases of bronchial asthma and ringworm of the feet fell into three groups, (I) comprising *Monilia* [*Candida*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*: *R.A.M.*, xii, p. 692]; (II) represented by *M. parapsilosis* and Stovall's *M.* type 1 [ibid., xi, p. 373]; and (III) containing only *M.* [*C.*] *krusei*.

KUROTCHKIN (T. J.) & LIM (C. E.). **Experimental bronchomoniliasis in sensitized rabbits.**—*Proc. Soc. Exper. Biol. and Med.*, xxxi, 3, pp. 332–334, 1933.

It was experimentally shown that previous sensitization of rabbits with intravenous injections of heat-killed cultures of *Monilia* [*Candida*] *tropicalis* [*R.A.M.*, xi, p. 373] renders the animals susceptible to the subsequent intratracheal administration of the fungus. The lung infection is confined to the formation of multiple firm bodies containing caseous material, from which the fungus can be isolated. Old cultures rich in filamentous growth were shown to be somewhat more capable of producing lung lesions than young ones composed chiefly of budding cells.

HUANG (P. T.). **Über einen Fall von dyshidrosiformer, oberflächlicher Hautaktinomykose der Handteller und Fusssohlen.** [On a case of dysidrosiform, superficial skin actinomycosis of the palms of the hands and soles of the feet.]—*Dermatol Wochenschr.*, xcvii, 48, pp. 1679–1685, 2 figs., 1933.

Clinical details are given of a case of actinomycosis in a 32-year-old woman at Sendai, Japan. The disturbance had spread from the left to the right hand and thence to the feet. The organism isolated from the lesions and grown on a number of standard nutrient media, is considered to be a species of *Actinomyces* related to *A. keratolytica* [*R.A.M.*, x, p. 456]. It is characterized by a well-developed mycelium with hyphae 0·5 μ or more in breadth, very long chains of spherical or elliptical arthrospores, 0·7 to 1 μ, and short, rod-shaped elements.

CIARROCCHI (L.). **Onico ed epidermomicosi da Epidermophyton rubrum (Castellani.)** [Onychosis and epidermomycosis due to *Epidermophyton rubrum* (Castellani).]—*Giorn. Ital. di Dermatol.*, lxxiv, 6, pp. 1535–1549, 3 pl. (1 col.), 1933.

A detailed account is given of a case of onychosis, which spread from the finger-nails to the forearm, neck, thighs, and knees, in a 53-year-old Italian mechanic. The causal agent was identified as *Trichophyton purpureum* (*Epidermophyton rubrum*) [*T. rubrum* or *Sabouraudites ruber*: *R.A.M.*, xi, p. 44; xiii, p. 303], characterized in hanging drop cultures on 2 per cent. maltose or glucose agar by hyphae 3 to 6 μ in diameter, piriform conidia 5 by 2·5 μ, abundant aleuria, and chlamydospores of variable shape. The organism proved to be non-toxic to guinea-pigs. This is stated to be the first record of *T. rubrum* in Italy.

NICOLAUS (W.). **Ueber Histogenese und Altersbestimmung der durch Aspergillus fumigatus hervorgerufenen Veränderungen bei Hühnern.** [On histogenesis and determination of the age of the changes produced in fowls by *Aspergillus fumigatus*.]—*Zeitschr. für Infektionskrankh., &c. der Haustiere*, xlv, 2–3, pp. 191–209, 3 figs., 1933.

Aspergillosis was artificially induced in 8-months-old Leghorn hens by the intratracheal injection of a conidial emulsion of *Aspergillus fumigatus* [*R.A.M.*, xii, p. 372] in distilled water. The symptoms in the lungs and air sacs became apparent from eight hours after inoculation onwards. Conidial formation at first takes place entirely within the necrotic areas, then ceases and is ultimately resumed at a much later stage on the surface of the nodular lesions in the shape of a thick down. Three stages may be differentiated in the histological development of aspergillosis, namely, the subepithelial (up to 12 hours), the fructification phase (up to 3 days), and the period of capsule formation (from 3 days onwards).

LIESE (W.). **Bakteriologische und biologische Versuche mit Benzoesäure und Benzoesäure-Derivaten.** [Bacteriological and biological experiments with benzoic acid and benzoic acid derivatives.]—*Arb. aus dem Reichsgesundheitsamte*, lxvi, 4, pp. 545–554, 1933.

In this paper (reprinted from *Arch. für Hygiene*, cx, pp. 355 *et*

seq., 1933) the writer, after describing his experiments on the efficacy of benzoic acid [*R.A.M.*, xii, p. 695] and its derivatives as food preservatives, calls attention to the possibility of the utilization of these compounds by food spoilage organisms as a source of carbon. *Penicillium glaucum* and *P. brevicaule* grew satisfactorily in a synthetic medium with the addition of 0·1 per cent. benzoic acid, over 0·2 per cent. sodium benzoate, 0·5 per cent. p-oxybenzoic acid, over 2 per cent. of the sodium salt of p-oxybenzoic acid, and 0·013 per cent. of the methyl, ethyl, and propyl esters. No growth was made, however, in the presence of the sodium salt of p-chlorbenzoic acid.

ZAPROMETOFF (N.). Список болезней новых лубяных культур Средней Азии. [List of diseases of new fibre plants in Central Asia.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 20–21, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

This is a very brief annotated list [arranged by the hosts] of the chief diseases and troubles recorded up to 1932 of the following newly introduced fibre-yielding plants in Russian Central Asia: kendir fibre (*Apocynum sibiricum*) [*A. venetum*], ambari hemp (*Hibiscus cannabinus*), American jute (*Abutilon avicennae*), okra (*H. esculentus*), sunn hemp (*Crotalaria juncea*), ramie (*Boehmeria nivea*), jute (*Corchorus capsularis*), and hemp (*Cannabis sativa*). [Most of the diseases listed are mentioned in the following abstracts.]

KHOKHRYAKOFF (M. K.). Новые виды грибных паразитов на новых лубяных растениях. [New species of parasitic fungi on the new fibre-yielding plants.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 61–67, 8 figs., Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Russian descriptions and Latin diagnoses are given of 15 species of parasitic fungi considered to be new to science which have been collected on the territory of the Russian Soviet Republics on species of *Abutilon*, kendir fibre (*Apocynum venetum*), ramie (*Boehmeria nivea*), jute (*Corchorus capsularis*), *Asclepias cornutus*, and ambari hemp (*Hibiscus cannabinus*). In addition to those of which a preliminary description has already been cited [*R.A.M.*, xii, p. 631] the following are included. *Stagonospora abutilonis* Chochr. on *Abutilon avicennae* leaves causes whitish spots with a narrow brown margin. The pycnidia are up to 130 μ in diameter, with a prominent ostiole, and contain 3- to 7-septate, straight or slightly curved, subhyaline (cinnamon in mass) pycnospores, 16 to 31 by 4 to 6 μ. *Septoria abutilonis* Chochr. on *A. divaricata* leaves forms cinnamon-grey to yellow spots up to 5 mm. in diameter, with an indistinct dark margin. The subglobose pycnidia are up to 140 μ in diameter and contain cylindrical, slightly curved, indistinctly septate pycnospores, narrowed at one end, and 45 to 77 by 3 to 4 μ. *Leptosphaeria apocyni* Bondarz. on *Apocynum venetum* stems forms white spots up to 10 mm. long, with erumpent perithecia up

to 180 μ in diameter, oblong-clavate to cylindrical asci, 60 to 65 by 9 to 11 μ, and 3- to 5-septate, fusiform, coloured ascospores, 21 to 27 by 4 to 5 μ. *Phoma apocyni* Bondarz. on the same substratum causes large chestnut spots with copious pycnidia up to 230 μ in diameter, containing cylindrical, hyaline pycnospores, 6 to 8 by 2·7 to 3 μ. On jute (*C. capsularis*) *Ascochyta corchoricola* Chochr. causes an irregular, whitish-grey leaf spot, 2 to 3 mm. in diameter and sometimes abscissed. The pycnidia are up to 125 μ in diameter and contain uniseptate, slightly constricted spores, 7 to 9·3 by 3 to 3·5 μ. *Leptosphaeria asclepiadis* Chochr. and *Clasterosporium asclepiadis* Tropova are also described from *Asclepias cornutus*.

LETOFF (A. S.). Некоторые данные о болезнях новых лубяных культур в Дагестане (**1930** г.). [Some notes on diseases of new cultivated bast-yielding plants in Daghestan (1930).]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 37–43, 2 pl., Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Brief notes are given on the chief diseases of ambari hemp (*Hibiscus cannabinus*), American jute (*Abutilon avicennae*), kendir fibre (*Apocynum* spp.), and okra (*H. esculentus*) observed in Daghestan in 1930, among which the following may be mentioned. *H. cannabinus* exhibited a slight incidence (not over 3 per cent.) of a dwarf disease believed to be caused by a virus, as no organism could be isolated from diseased plants. The condition is characterized by a stunting of the whole plant, which never reaches more than one-fifth of the height of a normal one. The leaves are curled and crimped, and usually of a reddish or yellowish tinge, and the apical ones assume the form of a rosette. Affected plants rarely blossom and do not fruit. A species of *Pleosphaerulina* was observed on living leaves of the same host, and is provisionally referred to *P. suchumica* (Seim) Sacc., although it differs in some points from the original description of this species on okra, which is cited for comparison. This is stated to be the first record of this fungus on ambari hemp. Other fungi mentioned on this host include *Oidiopsis hibisci* and *Ascochyta hibisci-cannabini* [*R.A.M.*, xii, p. 632].

GUTNER (L. S.). Новые болезни Конопли, Бамии и Испанского Дрока. [New diseases of Hemp, Okra, and Spanish Broom.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 71–72, 2 figs., Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Russian descriptions and Latin diagnoses are given of three species of parasitic fungi collected in Transcaucasia, which are considered to be new to science. *Pleosphaerulina cannabina* forms on the living leaves of hemp (*Cannabis sativa*) small, ochraceous, amphigenous spots, 2 to 4 mm. in diameter. The perithecia are globose, brownish, amphigenous, emergent, up to 125 μ in diameter. The asci are saccate, sessile, straight or bent, with a

thickened apex, 60 by 35 μ, without paraphyses, and contain eight oblong-ellipsoidal, muriform spores with 3 to 5 transverse septa, frequently sharply constricted in the middle, and measuring 30 by 12 to 15 μ. *Mycosphaerella hibisci* forms on living leaves of okra (*Hibiscus esculentus*) large, oblong, brownish spots, 1 to 4 cm. in diameter, frequently with a darker margin. The perithecia are epiphyllous, globose, light brown, up to 75 μ in diameter. The asci are clavate, sessile, 32 to 43 by 10 to 15 μ, with eight elliptical or spindle-shaped, distichous or subdistichous, two-celled, at first hyaline and later greenish spores, measuring 11 to 13 by 5·8 μ. *Colletotrichum spartii* forms on living stems of Spanish broom (*Spartium junceum*) numerous gregarious, at first subepidermal and later erumpent acervuli provided with setae, and up to 150 μ in diameter. The spores are subclavate, inequilateral, curved, and 12 to 16 by 3 to 6 μ in diameter.

Schmidt (V. V.). Болезни Кендыря и Кенафа. (Из отчета по работе на САНИС Новлубинститута в **1931** г.). [Diseases of Kendir Fibre and Ambâri Hemp. (From the Report for 1931 of the SANIS Station of the Institute for New Fibres).]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 13–19, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Notes are given on the chief diseases of kendir fibre [*Apocynum venetum*] and ambari hemp [*Hibiscus cannabinus*] which were investigated in 1931 at the SANIS Station in Russian Central Asia. Of considerable economic importance is stated to be the root rot and wilt of kendir caused by an unidentified species of *Fusarium*. The disease is most severe in low-lying, moist soil, where from 50 to 70 per cent. of the seedlings may be destroyed. Older plants are much less susceptible, since while the incidence of the rot among transplants ranged from 1·7 to 9·7 per cent. in the first year it was less than 0·5 per cent. in two-year-old transplants. Observations indicated that varieties of *A. venetum* vary very considerably in their relative susceptibility to rust (*Melampsora apocyni*) [*R.A.M.*, xi, p. 182], those originating from regions with a damp climate (e.g. Kuban, in North Caucasus) showing a higher degree of resistance than the native varieties, which are severely injured; the highest susceptibility was exhibited by the Pictum variety. A small-scale experiment indicated that *M. apocyni* is controllable by heavy dusting with sulphur. Other diseases of this host that were investigated included stem spot (*Septoria apocyni*) [ibid., xii, p. 631], which was most severe on varieties originating from the valleys of the rivers Ili and Amu-Darya, chiefly attacked adult plants over five years old, and proved capable of considerably reducing the quality of the fibre. Observations showed that it first appears towards the end of June, when the plants are practically ready for harvesting, so that most of the damage may be averted by harvesting the crop as early as possible. As a rule diseased plants fail to set seed. Leaf spot (*S. littorea*) [ibid., x, p. 435] is also prevalent on certain varieties of kendir fibre, especially those with glabrous leaves.

The diseases of ambari of the greatest economic importance are bacteriosis of the leaves and stem tops, caused by unidentified species of *Bacterium*, sooty moulds, the powdery mildew *Leveillula* [*Oidiopsis*] *taurica* [*R.A.M.*, xi, p. 183; xii, p. 747], wilt (*Fusarium vasinfectum*), and root rot caused by an unidentified species of *Fusarium* and by *Moniliopsis aderholdi*.

LANTZOVA (Mme M. V.) & TCHERNYAK (S. L.). Работа по фитопатологии на Чуйской зональной станции Новлубинститута за лето **1932** г. [Phytopathological work at the River Chu Regional Station of the Institute for New Fibres during the summer of 1932.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 5–11, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

The kendir fibre plant [*Apocynum venetum*], a recent introduction in the Soviet Republic of Kirghizia [basin of the river Chu, formerly Akmolinsk], is stated to be extensively and severely attacked there by rust (*Melampsora apocyni*), stem spot (*Septoria apocyni*), and melanose (*Septoria littorea*) [see preceding abstract]. Experiments in 1932 on the control of rust by dusting with sulphur or spraying with 1 per cent. Bordeaux mixture gave negative results, presumably because the treatments were applied when the rust was already well established. The detrimental action of the rust on the host was shown by the fact that severely infected plants on the average yielded 31 gm. air-dried bast and 25·9 gm. fibre, as against 66·5 and 32·5 gm., respectively, obtained from slightly affected plants (no entirely disease-free plants could be found to serve as control); the average length of the fibre was reduced from 13·4 in the latter to 12·3 [? cm.] in the former. In the upper reaches of the river Chu kendir fibre was also fairly severely attacked by a wilt associated with a root rot, an unidentified species of *Fusarium* developing from affected tissues placed in a moist chamber. This disease was not seen lower down the river.

Hemp [*Cannabis sativa*], stated to be very widely cultivated in this region, is apparently immune from fungal diseases locally.

BAKHTIN (V. S.) & GUTNER (L. S.). Новое заболевание Конопли. [A new disease of Hemp.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 68–70, 1 fig., Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

A brief account is given of a leaf spot which was observed in 1931 in experimental plots of hemp (*Cannabis sativa*) in the neighbourhood of Leningrad, and which was especially prevalent on varieties originating from France and Japan. The causal organism is a species of *Macrosporium* close to *M. sarcinaeforme* on clover [*R.A.M.*, xi, p. 377], but differing from it sufficiently to be considered a new species which is named *M. cannabinum*, a Latin diagnosis being appended. The spots are numerous, rounded or sinuous, concentrically zoned, greyish-green or brownish, with a darker margin, 3 to 10 mm. in diameter, and frequently

coalescing. The conidiophores are subhyaline, torulose, septate, and 75 to 120 by 6 to 7·5 μ. The conidia are ellipsoidal or rounded, blackish-olive, muriform, with three to six transverse and two to four longitudinal septa, minutely warted, constricted at the septa, without a pedicel, and measure 30 to 45 by 15 to 22 μ.

SCHWARZMANN (S. R.). Болезни Кенафа и Канатника по данным наблюдения **1930** г. на Северном Кавказе. [Diseases of Ambari Hemp and American Jute according to observations in North Caucasus in 1930.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 44–50, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

The author gives brief notes on the symptoms and relative importance of the main diseases of ambari hemp [*Hibiscus cannabinus*] and American jute [*Abutilon avicennae*] which were observed in North Caucasus in 1930. Only the generic names of the fungi concerned are given.

LISSITZYNA (Mme M. I.). Осенние наблюдения над болезнями новых лубяных культур в условиях Дагестана. [Autumn observations on the diseases of new cultivated bast-yielding plants under Daghestan conditions.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 29–36, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Ambari hemp [*Hibiscus cannabinus*] was severely attacked by *Botrytis* [*cinerea*: see next abstract] in 1931 on the Borozdinsky Farm in Daghestan. The fungus was first observed at the beginning of August on the stems, on which it formed dark, water-soaked spots, under which the cortical tissues rotted and eventually peeled off, leaving bare the bast in a badly macerated condition. The infection rapidly extended, until by the middle of October from 50 to 65 per cent. of the plants were diseased, many of the stems breaking at the points of infection. The disease was particularly prevalent and severe on freshly broken land, on which the stands were most vigorous and dense. The fungus also attacked the leaves and the immature seed capsules, reducing the production of seed though the latter was not infected. The fungus appears to gain entry into the host tissues chiefly through insect injuries. It continued to exist saprophytically on the cut ambari hemp, on which, however, it was more superficial and did not affect the quality of the fibre as heavily as in the attack on the growing plant.

Another widespread disease of ambari hemp, for which the descriptive name 'grey bast' is suggested, was caused by an unidentified species of *Fusarium*, of the section *discolor*. The disease first appears on the roots, in the form of dark brown spots; later the whole root darkens and the cortex rots. From the roots the fungus spreads into the stems, all the tissues of which are permeated by a dense mycelium, on which innumerable intercalary chlamydospores are formed in clumps. The bluish- (occasionally greenish-) grey colour of badly decomposed bast is caused by the

accumulation of the chlamydospores which form between it and the xylem. Infected roots incubated at a temperature of 25° to 28° C. developed an abundant white aerial mycelium with five- (rarely three- or four-) septate, slightly curved macroconidia measuring 21 to 37·5 by 3·7 μ, and microconidia 8·5 to 13 by 2·9 to 3·8 μ. This disease, as well as two others of the same host, associated with two different species of *Fusarium*, are being further investigated. A species of *Alternaria* [referred to *Macrosporium hibiscinum* Thüm. in an editorial footnote] caused a leaf spotting of minor economic importance on ambari hemp.

American jute [*Abutilon avicennae*] suffered chiefly from two different stem spots, one associated with an unnamed *Fusarium* [the microscopic characters of which are briefly described], and the other with a sterile fungus not yet identified.

Notes are also given on kendir fibre rust (*Melampsora apocyni*) [see above, p. 375].

NAZAROVA (Mme E. S.). Весенние наблюдения над болезнями новых лубяных культур в условиях Дагестана. [Spring observations on the diseases of new cultivated bast-yielding plants under Daghestan conditions.]—*ex* Болезни и вредители новых лубяных культур [Diseases and pests of new cultivated textile plants], pp. 25–28, Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

Observations in the early spring of 1932 at the Borozdinsky Farm in Daghestan showed that sheaves and stacks of ambari hemp [*Hibiscus cannabinus*] left over winter in the field suffered very severely from attacks of *Botrytis cinerea* [see preceding abstract] which, in the form of sclerotia, remained viable throughout the winter and produced abundant conidia at the beginning of April. The fungus was also found thriving on the stubble from the preceding crop, and was readily isolated from the superficial layers of soil in the infected fields. It was also present in two-year-old stacks and sheaves, but its growth was considerably masked and suppressed by various black moulds that injure the fibre as much as *B. cinerea*. These moulds also attack stacked American jute [*Abutilon avicennae*] and hemp [*Cannabis sativa*], from which *B. cinerea* was not isolated, although the appearance of the stacks and sheaves of these two plants gave reasons to suspect its presence. Some stem spotting, injurious to the fibre, also occurred on ambari, associated with a species of *Rhabdospora*, and on hemp, associated with a *Dendrophoma*. In sheaves *H. cannabinus* was also heavily attacked by a species of *Fusarium* which formed fairly large (up to 1·5 mm.) pink sporodochia on the stems, and imparted a pink discoloration to the fibre. This fungus was found twice on American jute and once on hemp.

In a neighbouring farm, kendir fibre [*Apocynum venetum*] was fairly severely attacked by *Septoria littorea* and *S. apocyni* [see above, p. 375].

TROPOVA (Mme A. T.). К материалам по болезням Канатника. [A contribution to the diseases of American Jute.]—*ex* Болезни и вредители новых лубяных культур [Diseases and

pests of new cultivated textile plants], pp. 58–60, 3 figs., 1 pl. (at the end of volume), Новлубинст. ВАСХНИЛ [Inst. New Bast Raw Material VASKhNIL], Moscow, 1933.

American jute (*Abutilon avicennae*) plants growing near tobacco plantations in North Caucasus in 1930 developed a condition closely resembling reticulate mosaic of tobacco, and characterized by a darker green colour than normal of some portions of the leaf blade, with a vein-clearing effect. Experiments are in progress to determine the nature of the trouble and whether it is transmissible from tobacco to *A. avicennae*. In North Caucasus and the Don region, the latter host is also attacked by a species of *Clasterosporium* which is regarded as a new species and named *C. abutilonis* [with a Latin diagnosis]. The fungus forms on the leaves dark brown, confluent spots up to 0·5 cm. in diameter, which may invade the whole blade and cause defoliation. The conidia are oblong-ellipsoidal, light brown, with up to 9 transverse septa, and 116 to 120 by 23 to 24 μ in diameter. In the Russian Far East, Ukraine, and North Caucasus, American jute is occasionally attacked by *Ascochyta abutilonis* Hollós, which forms white spots on the stems, destroying the cortical tissues but leaving the bast fibres intact. This suggests the possibility of using this fungus for the rapid retting of American jute stems without immersion in water.

Luz (G.). **Ueber ein neues Verticilliumvorkommen.** [On a new occurrence of *Verticillium*.]—*Ber. Schweiz. Bot. Gesellsch.*, xlii, 2, pp. 754–761, 1 fig., 2 graphs, 1933. [Received April, 1934.]

From a damaged wallpaper examined at the Zürich Technical Institute the writer isolated a fungus characterized by hyaline, septate hyphae, septate, erect, often brownish, lateral conidiophores, with verticillate lateral branches, 100 μ in length and 3·5 μ in thickness, bearing yellowish-brown, elliptical or bean-shaped conidia, 2·8 to 12 (mostly 4·9) by 2·3 to 3 μ. The organism was identified as *Verticillium cinnabarinum* [*R.A.M.*, vii, p. 471], though differing in certain particulars from the culture determined as the species of Reinke and Berthold at the Centraalbureau voor Schimmelcultures, Baarn. Thus, the Swiss form sporulates more profusely than the latter, the conidial length of which ranges from 2·8 to 8·8 μ, with the greatest number at 4·4 μ. The optimum temperature for the growth of both forms was found to be 21° C., but the Swiss one developed slightly better than the original at 27°. The fungus had utilized the cellulose in the wallpaper to such an extent that the fibres were destroyed. After a few months in artificial culture on malt agar the capacity to assimilate cellulose was entirely lost.

Blattný (C.). **Virové choroby Pelargonií.** [Virus diseases of Pelargoniums.]—*Ochrana Rostlin*, xiii, 3–4, p. 145, 1933.

The author draws attention to the existence in Czecho-Slovakia of at least two virus diseases of pelargoniums, in addition to leaf curl [*R.A.M.*, xii, p. 223], namely, aucuba mosaic which apparently does not affect the growth of the host, and an interveinal chlorosis,

characterized in young plants by a pale green discoloration of the leaf areas between the veins which are of a deep green; in older leaves the only symptom is a darker coloration than normal of the leaf margins, while in mature leaves the disease is marked by an irregular and diffuse dispersion of the normal green colour and by a smaller size of the leaves than normal. This condition was transmitted to healthy plants by grafting.

DRECHSLER (C.). **Vascular wilt and root rot of Pansies due to Aphanomyces sp.**—Abs. in *Phytopath.*, xxiv, 1, pp. 7–8, 1934.

Late in April, 1933, pansies [*Viola tricolor*] in the same beds that they had occupied for several consecutive years developed symptoms of wilt, which became progressively more severe. The vascular cylinder showed a deep orange-reddish discoloration, and by the middle of May the stem bases and roots were extensively rotted and the aerial organs collapsed and shrivelled. Numerous oospores of a species of *Aphanomyces* were observed surrounding the discoloured vascular cylinders in the early stages of infection; the fungus was found to differ morphologically from *A. euteiches* on peas and did not altogether agree with the Dutch form of the latter, P.F.2 [*R.A.M.*, viii, p. 187].

HANSEN (H. N.) & SCOTT (C. E.). **A canker and gall disease of Gardenia.**—*Science*, N.S., lxxix, 2036, p. 18, 1934.

A species of *Phomopsis* with hyaline, unicellular, elliptic-fusiform A spores measuring 9·7 by 3·4 μ and hyaline, unicellular, filiform, curved or flexuous B spores, 22·2 by 1·4 μ, was readily isolated in pure culture from several greenhouse gardenia varieties affected by a canker and gall disease in California. Infection appears to occur exclusively through wounds, mostly near the soil. Oblong cankers, frequently with a corrugated surface, develop on branches and stems at a distance from the soil. On infected crowns the cankers, originally of the foregoing type, soon become overgrown with hypertrophied cortical tissue involving the entire circumference of the stem, increasing its diameter to twice the normal or more, and extending longitudinally in both directions from the site of infection for one or two inches, giving the effect of an oblong gall. In both cankers and galls the cortex is coloured bright yellow for some distance ahead of the invading fungus.

PAPE (H.). **Die Mosaikkrankheit der Lilien.** [The mosaic disease of Lilies.]—*Gartenwelt*, xxxvii, pp. 324–325, 364, 4 figs., 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxix, 17–20, pp. 431–432, 1934.]

Lily mosaic [*R.A.M.*, xiii, p. 165] is characterized by a pale green mottling of the foliage, often accompanied by distortion, desiccation, and a brown discoloration, the flowers being frequently malformed and the whole plant stunted. The virus is stated to be transmitted by *Aphis gossypii* [ibid., x, p. 247]. At temperatures below 22° C. and in shady, cool sites the foliar irregularities are more pronounced than under warmer conditions. In a Schleswig-Holstein nursery-garden *Lilium longiflorum* var. *formosanum* was the only variety

affected, *L. longiflorum* var. *erabu*, *L. auratum*, and others remaining healthy.

BRIERLEY (P.) & McWHORTER (F. P.). **A mosaic disease of bulbous Iris.**—Abs. in *Phytopath.*, xxiv, 1, p. 4, 1934.

A destructive mosaic disease of bulbous irises [*R.A.M.*, xi, pp. 430, 796, 797] is stated to have been introduced into the United States on stocks of European origin. The diseased plants are dwarfed, with yellow-striped or mottled leaves and blotched flowers. From 1929 to 1933, 41 per cent. infection was obtained by tissue-grafting experiments, 12 per cent. by nodal injections with hypodermic needles, and 56 per cent. by internodal pith injections. Natural transmission appears to be due to aphids, *Myzus persicae* and *Illinoia solanifolia* [*Macrosiphum gei*] giving 100 per cent. infection in four trials on 50 plants, and 31 per cent. in 14 trials on 122 plants, respectively.

MAINS (E. B.). **Host specialization in the rust of Iris, Puccinia iridis.**—*Amer. Journ. of Botany*, xxi, 1, pp. 23–33, 4 figs., 1934.

The results of an examination of numerous species and varieties of *Iris* naturally infected and artificially inoculated with *Puccinia iridis* [*R.A.M.*, ix, p. 38] proved the existence of at least two biologic forms, namely, sp. f. *australis*, occurring with particular virulence on *I. fulva* and *I. foliosa*, and sp. f. *septentrionalis*, to which the foregoing and a number of well-known horticultural varieties are markedly resistant while others, including *Hermodactylus tuberosus* (also sometimes known as *I. tuberosa*) are susceptible. The probable existence of several other biologic forms is suggested by the resistance to the forms under observation of certain species and groups reported elsewhere as susceptible.

RIEFENSTAHL (S.). **Wachsende Verluste durch die Hartfäulekrankheit der Gladiolen.** [Growing losses from the hard rot disease of Gladioli.]—*Gartenwelt*, xxxvii, p. 314, 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxix, 17–20, p. 428, 1934.]

The damp summer weather prevailing during recent years in Germany is stated to have favoured outbreaks of hard rot (*Septoria gladioli*) [*R.A.M.*, xi, p. 24 *et passim*] among gladiolus stands, the incidence of infection ranging from between 10 and 20 per cent. in the America variety to 90 per cent. in War. Within the Primulinus group only Scarletta is susceptible. In addition to regular change of site and the use of healthy planting material, the immersion of the corms for 1½ to 2½ hours in 0·15 to 0·20 per cent. uspulun is recommended.

GHAMRAWY (A. K.). **Rotting of Galtonia bulbs caused by Fusarium culmorum (W. G. Sm.) Sacc. and Penicillium corymbiferum Westling.**—*Trans. Brit. Mycol. Soc.*, xviii, 3, pp. 249–252, 1 graph, 1933.

A brief account is given of pathogenicity tests of a strain each of *Fusarium culmorum* and *Penicillium corymbiferum* [cf. *R.A.M.*, xi, p. 460] which were isolated from rotting Cape hyacinth

(*Galtonia candicans*) bulbs of Dutch origin, stored in a Covent Garden warehouse. The results showed that both strains actively attack the bulbs under a variety of storage conditions, *F. culmorum* being the more active parasite at temperatures of about 28° C. Further experiments showed that *P. corymbiferum* and a similar form isolated from lily were alone able to cause rotting of *G. candicans* bulbs planted in soil in the open, and then only when inoculated through wounds.

KEUR (J. Y.). **Partial recovery and immunity of virus-diseased Abutilon.**—Abs. in *Phytopath.*, xxiv, 1, pp. 12–13, 1934.

Abutilon plants sometimes recover partially from the effects of the virus of infectious variegation [*R.A.M.*, xii, p. 375], green-leaved branches developing on mottled diseased plants. Baur [cf. ibid., viii, p. 662] claimed that such branches on *A. thompsoni* were immune. The following results were obtained with green branches of five variegated species of *Abutilon*. The virus is absent from such branches, as shown by the failure of scions from them to infect susceptible green clones. The virus does not traverse the green branches in sufficient amounts to produce variegated symptoms in susceptible green scions grafted on the green branches. The latter, however, are not actually immune, green clones propapated from them being liable to reinfection, not only by scions of other variegated *Abutilon* clones, but also by those of their own variegated clones.

SILOW (R. A.). **A systemic disease of Red Clover caused by Botrytis anthophila Bond.**—*Trans. Brit. Mycol. Soc.*, xviii, 3, pp. 239–248, 1 pl., 1 fig., 1 graph, 1933.

This is a brief report of the author's studies of *Botrytis anthophila* [*R.A.M.*, vi, p. 98] on red clover [*Trifolium pratense*] at the Welsh Plant Breeding Station, Aberystwyth, which in its morphological and cultural characters agreed well with Bondartzeff's description. It was shown that the ash-grey discoloration of the diseased anthers is due to the development of conidiophores and spores of the fungus, which often envelop both anthers and stigma. The mycelium ramifies among the pollen grains, the conidiophores breaking through the anther walls. It was experimentally shown that bees play an important part in the dissemination of the disease by carrying the spores from infected to healthy flowers. After having reached the stigmas, the spores germinate by producing very fine hyphae which rapidly traverse the stylar canal, and after some days increase in diameter to about 3 or 4 μ. Infection of healthy red clover flowers was also secured by cross-pollination with pollen either naturally or artificially contaminated with spores. The infection becomes systemic in plants grown from internally infected seed, and hyphae of the parasite can be detected in the intercellular spaces of the pith, rarely forming haustoria in the pith cells, as well as in the tissues at the base of the corolla and filament tube. There was evidence that the fungus considerably reduces the fertility of the male plants, and also the yield in seed of female plants. Field observations in 1930 showed that the

disease was widely distributed in red clovers of various origins, especially on the late-flowering varieties.

B. antherarum trifolii Schlecht is regarded as synonymous with *B. anthophila*, and it is believed that *B. trifolii* [ibid., vi, p. 489] is probably a variety of this species, differing perhaps slightly in the size of conidia and in certain cultural characteristics.

KLINKOWSKI (M.) & RICHTER (H.). **Der Stengelbrenner (Anthraknose) der Luzerne, verursacht durch den Pilz Colletotrichum trifolii.** [Stem scorch (anthracnose) of Lucerne caused by the fungus *Colletotrichum trifolii*.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 1, pp. 1–3, 3 figs., 1934.

Lucerne in the experimental field of the Biological Institute, Berlin-Dahlem, was attacked in August, 1933, by *Colletotrichum trifolii* [*R.A.M.*, xiii, p. 168], not hitherto recorded in Europe. The symptoms of the anthracnose disease are briefly described in popular terms, and attention is drawn to the risk of confusion between *C. trifolii* and *Gloeosporium caulivorum* [*Kabatiella caulivora*], a common parasite of red clover (*Trifolium pratense*) in Europe [ibid., xi, p. 768], from which lucerne, however, appears to be immune [ibid., vi, p. 100].

APPEL (O.). **Gräserkrankheiten.** [Grass diseases.]—*Deutsche Landw. Presse*, lx, 51, p. 641, 1 col. pl., 1933.

A popular note is given on the following well-known diseases of grasses in Germany: ergot (*Claviceps purpurea*) and *Fusarium* on *Lolium perenne* [*R.A.M.*, xi, p. 364]; *Sclerotium rhizodes* [ibid., xii, p. 450] on *Phalaris arundinacea*; and *Epichloe typhina* [ibid., xiii, p. 169] on *Festuca rubra* and other meadow grasses.

NATTRASS (R. M.). **A new species of Hendersonula (H. toruloidea) on deciduous trees in Egypt.**—*Trans. Brit. Mycol. Soc.*, xviii, 3, pp. 189–198, 2 pl., 5 figs., 1933.

Stone fruit trees, and to a lesser degree the apple, are stated to be widely affected throughout Egypt by a serious form of gummosis and die-back, the first outward symptom of which in mature trees is a wilting and die-back of twigs and branches, with a copious exudation of a gum-like substance. The trouble may either gradually spread to the whole tree which may survive one or two seasons, or trees in their prime and in full bearing may suddenly wilt and die within a short time. While observations indicate that the disease is primarily due to unsuitable soil conditions and waterlogging, isolations from affected tissues almost invariably yielded a pure culture of a *Torula* form which, on sterilized blocks of cotton and willow twigs, produced black or grey, spongy stromata, in which in from one to four months black, carbonaceous pycnidia developed. Similar structures were found during the summer of 1930 in nature on branches of apricot trees in Maadi, Cairo. These stromata, which originated in the cortex, varied considerably in shape and size (up to 1·5 by 0·5 mm.); they were either immersed or erumpent, and contained one or more locular, immersed, or protuberant pycnidia which also greatly varied in size and shape, ranging from spherical to cuneiform, oval, or vertically elongated.

The sporophores are hyaline, terete, continuous, and 8 to 10 μ in length. The pycnospores are oblong or oval, at first hyaline and continuous, later frequently two-septate, with a dark central cell, and 12 to 13·5 (exceptionally 17) by 4 to 5·5 μ. Paraphyses were not observed. Monospore cultures from these spores again produced the *Torula* form, identical with that of the original isolations. The fungus is considered to be new to science and is named *Hendersonula toruloidea*, a Latin diagnosis of which is appended.

CROWELL (I. H.). **Fungicidal control of Gymnosporangium juniperi-virginianae and related species.**—Abs. in *Phytopath.*, xxiv, 1, pp. 5–6, 1934.

Of the numerous fungicides tested in three years' experiment at the Arnold Arboretum of Harvard University against *Gymnosporangium juniperi-virginianae* and other species on red cedars [*Juniperus virginiana*] and various susceptible Pomaceae [*R.A.M.*, xiii, p. 311 and next abstract], a special form of pure colloidal sulphur from a Boston chemical firm was the only one to confer complete protection on the aecidial hosts. Tests in the direct treatment of the red cedars, the eradication of which to save the alternate pomaceous hosts might thus be obviated, are in progress with some promising materials.

CROWELL (I. H.). **Relative susceptibility of the species of Malus to Gymnosporangium juniperi-virginianae.**—Abs. in *Phytopath.*, xxiv, 1, p. 6, 1934.

Most of the known species of *Malus* [*Pyrus*] have been tested at the Arnold Arboretum for their reaction to *Gymnosporangium juniperi-virginianae* [see preceding abstract], with results ranging from high susceptibility to complete immunity. All the species of the section *Chloromeles*, which are native to eastern North America, were found to be susceptible. Evidence of biologic specialization was obtained in inoculation tests with collections of the fungus from eight States.

PALMITER (D. H.). **Variability in monoconidial cultures of Venturia inaequalis.**—*Phytopath.*, xxiv, 1, pp. 22–47, 2 figs., 1 graph, 1934.

This is an expanded account of the writer's studies on the variations in monoconidial cultures of *Venturia inaequalis*, isolated from 14 apple varieties in Wisconsin, Oregon, Michigan, and New York, a note on which has already appeared [*R.A.M.*, xi, p. 461]. All the cultures grew best at 20° C. between P_H 4·8 and 5·8, but there were marked differences between the individual strains in their rate of development at these optima. Some of the cultures produced sectors differing from the parents in general appearance, spore production, and growth rate. Of 13 species of *Malus* [*Pyrus*] inoculated with six cultures of *V. inaequalis*, nine were infected by one or more and one (*P. niedzwetzkyana*) by all; neither *P. floribunda* nor *P. angustifolia* proved susceptible in these tests. These results are considered to indicate that the apple scab organism is a complex of numerous strains varying in their morphotogical and physiological characters.

ROBERTS (J. W.). **Apple target canker, measles, and rough bark.** —Abs. in *Phytopath.*, xxiv, 1, p. 16, 1934.

A bacterium, probably *Pseudomonas papulans* [*R.A.M.*, x, p. 604], has been isolated from the papulate early stage of apple target canker and rough bark in the Delicious and Yellow Newtown varieties, respectively. Measles, target canker, and rough bark may prove to be forms of an identical disease, the early stages of which are similar and apparently all associated with the same organism. The apple diseases observed by Miss Lacey and Dowson in England [ibid., x, p. 603] and by Hopkins [the 'Elgin' disease: ibid., vii, p. 328] in South Africa may also be of related origin.

COOLEY (J. S.). **Winter injury and drought in relation to Apple root rot (Xylaria mali).**—Abs. in *Phytopath.*, xxiv, 1, p. 5, 1934.

Black root rot of apple (*Xylaria mali*) [*R.A.M.*, xi, p. 284] is stated to be much more prevalent on the lower slopes of badly drained hillsides in Virginia and other eastern States than on higher and better drained areas where winter injury is less prominent. Drought appears to be another important contributory factor in the causation of this type of root rot.

WIESMANN (R.). **Der Spät- oder Kahlschorf der Birnblätter und seine Bedeutung für die Ueberwinterung des Birnschorfpilzes.** [The belated or sterile scab of Pear leaves and its significance in the overwintering of the Pear scab fungus.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xlii, 2, pp. 18–23, 4 figs., 1933. [Abs. in *Exper. Stat. Record*, lxx, 1, p. 58, 1934.]

A practically sterile type of pear scab (*Venturia pirina*) is described, which occurs in Switzerland in the autumn on the leaves even of comparatively resistant varieties, causing premature defoliation and preventing the development of autumnal coloration. This form of scab was found to be without importance in the overwintering of the fungus, which produces no perithecia in the affected foliage. Scab outbreaks of this nature frequently occur in epidemic form towards the end of the season.

CIFERRI (R.). **Esperienze ed osservazioni sulla 'clorosi', sulla 'rosetta' e sul 'mal del piombo' nutrizionali del Pesco.** [Experiments and observations on nutritional 'chlorosis', 'rosette', and 'silver leaf disease' of Peach.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 4, pp. 432–536, 8 pl., 11 figs., 1933. [English summary.]

In this paper the author gives a detailed account of preliminary investigations conducted in 1932–3 into three non-parasitic diseases due to nutritional disturbances which are seriously threatening the recently established peach-growing industry in the vicinity of Alba, Piedmont, viz., chlorosis [*R.A.M.*, ix, p. 43; xii, p. 373], rosette [ibid., viii, p. 111], and the physiological form of silver leaf [ibid., vii, p. 557 and next abstract], the points mainly dealt with in each case being the local intensity, topographical distribution, and varietal susceptibility. The causes of the conditions under

the local prevailing conditions are discussed and suggestions made for their control.

A bibliography of 37 titles is appended.

CURZI (M.). **Il mal del piombo da necrosi e carie del legno in Italia.** [Silver leaf disease due to necrosis and decay of the wood in Italy.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 4, pp. 566–590, 1 pl., 3 figs., 1933. [English summary.]

After referring to previous investigations into silver leaf disease of peaches and plums and pointing out that although in many countries the condition is due to *Stereum purpureum* [*R.A.M.*, xii, pp. 36, 142], in others, including France and Italy, a non-parasitic form with similar symptoms is present [see preceding abstract], the author distinguishes between three main types of silver leaf, viz., that accompanied by necrosis and decay of the wood and associated with fungal attack, that characterized by the formation of calcium oxalate crystals in the leaves [ibid., iii, p. 46], and that due to meteorological conditions.

The first type (several cases of which are described) is the commonest and most serious form of silver leaf on peach and plum in Italy, though owing to the absence of fruiting bodies on the affected trees only scattered infections occur in any one orchard. From diseased branches the author isolated strains of a Basidiomycete varying slightly with the locality but not substantially different from *S. purpureum*; studies of the parasitism of this fungus are in progress.

Notes are given on the factors favouring the development and spread of this form of the disease, and there is a bibliography of 38 titles.

SCHWARZ (O.). **Beiträge zur Pathologie der Feige, Ficus carica L. I. Das Fruchtfäuleproblem in Kleinasien.** [Contributions to the pathology of the Fig, *Ficus carica* L. I. The fruit rot problem in Asia Minor.]—*Phytopath. Zeitschr.*, vi, 6, pp. 589–618, 1 graph, 1 map, 1933.

The writer has made a comprehensive study of fig spoilage in Turkey, where the heaviest damage was found to occur in the mountain valleys of Selçuk and the plain of Sokia, though an incidence of 10 to 15 per cent. was observed elsewhere, especially near Bayindir. The following types of injury are differentiated and described: wet rot, roughly corresponding to the American 'souring' [*R.A.M.*, x, p. 679], black rot ('smut') chiefly due to *Aspergillus niger* [ibid., xiii, p. 42], mouldy rot and grey rot ('mould'), and brown rot (with certain stages of the mouldy and grey rots) equivalent to 'endosepsis' [ibid., viii, p. 584] and associated largely with *A. ochraceus* and species of *Fusarium*. A list is given of 19 fungi and bacteria found associated with the rotting of figs, of which seven, namely, *Alternaria tenuis*, *Aspergillus niger*, *A. ochraceus*, *Fusarium* sp. allied to *F. heterosporum* [ibid., xi, p. 399], *F. moniliforme* [*Gibberella moniliformis*], and *Sarcina* sp., infected the fruit after caprification. In 27 figs from Selçuk *G. moniliformis* was responsible for the highest incidence of infection, occurring on 16 or 59·2 per cent. in the form of 'mouldy', 'brown',

or 'grey' rots [cf. ibid., viii, p. 257]. It appears unlikely, from an examination of the fungus flora of the so-called 'gall figs', i.e., those serving as a breeding-ground for the fig gall wasp, *Blastophaga psenes*, that the fungous spores are transmitted directly from these fruits to the caprifigs, only those of *A. niger* being in the least adapted to insect transmission. It is considered more probable that infection takes place during the ripening period when the 'eye' opens. During the height of summer the Turkish valleys are visited by quasi-cyclonic dust storms which aid the dissemination of the spores. It was shown by experiments [details of which are given] that the presence even of the typical rot fungi in ripening figs does not necessarily lead to decay. There is evidently some inherent predisposition in the figs themselves which governs their reaction to the invading fungi.

JENKINS (A. E.). **A species of Sphaceloma on Avocado.**—*Phytopath.*, xxiv, 1, pp. 84–85, 1934.

The species of *Sphaceloma* responsible for avocado (*Persea americana*) [*P. gratissima*] scab in Florida, Cuba, Porto Rico, Mexico, Peru, Rhodesia, and South Africa [*R.A.M.*, v, p. 310] is described technically as *S. perseae* n. sp., with a Latin diagnosis. Specimens from Peru and Rhodesia were not seen, the records being taken from the literature.

The lesions produced by the fungus are brown to almost black and up to 3 mm. in diameter. The acervuli develop into scattered to effuse sporodochia, dark or pale brownish-olive in the mass, and from 25 to about 70 μ in length. The conidiophores, uni- to bicellular at first, often about 12 μ in height by 2 to 7 μ at the base, tapering or acute to truncate at the apex, arise from hyaline, intra-epidermal hyphae or a prosenchymatous stroma; on rupturing the epidermis they increase in length either by continued growth or by conidia remaining *in situ* and developing as part of the conidiophore, a length of 25 to 50 or up to 100 μ being attained; at this stage they are more or less divergent, continuous to pluriseptate, straight or geniculate, usually simple, sometimes denticulate, and frequently becoming paler towards the apex. The hyaline or coloured, clear or granular, acrogenous or pleurogenous conidia may be spherical to cylindrical, measuring 2 to 30 by 2 to 5 μ; the hyaline ones are ovoid or oblong-elliptical, often 5 to 8 by 3 to 4 μ, sometimes biguttulate, while the coloured are elongated 1- to 6-cellular, up to 30 by 3 to 5 μ (often uni- to bicellular and 12 to 20 μ long). Sometimes the conidia are much enlarged or swollen and muriform. Germination takes place by hyaline sprout conidia or germ-tubes, often produced apically or subapically but also laterally.

The new species differs from *S. fawcettii* [ibid., xii, p. 689] in its generally larger and coarser, olive-coloured fructifications.

PALO (M. A.). **A Sclerotium seed rot and seedling stem rot of Mango.**—*Philipp. Journ. of Sci.*, lii, 3, pp. 237–261, 12 pl., 1 graph, 1933. [Received April, 1934.]

A species of *Sclerotium* was found in August, 1930, causing a rot of the seeds and seedling stems of mangoes in a nursery in

Luzon, Philippine Islands. The disease killed 10 per cent. of the seedlings and resulted in the decay of many seeds before or during germination. The stem rot was associated with a white mycelium bearing sclerotia on the basal parts of the seedlings. A blackish-brown lesion developed below or slightly in advance of the growing mycelium, and when the latter completely encircled the stem the leaves wilted and the seedling died. Numerous sclerotia, turning chocolate-brown at maturity and measuring 0·6 to 1·6 mm. in diameter, were also found on the cotyledons of the rotted seeds.

A comparative cultural study of the mango *Sclerotium, S. rolfsii* from rice and tomato, and four strains of *S. delphinii* [*R.A.M.*, xiii, p. 99] on a number of standard media at varying temperatures between 6° and 35·5° C. showed that the first-named is more closely related to *S. delphinii* than to *S. rolfsii* and it is accordingly considered to be a strain of the former. Among the more important differences between the mango *Sclerotium* and *S. rolfsii* are the slower rate of sclerotial production on agar media in the former (eight to ten days, compared with four to five); the concave or flattened shape of the mango sclerotia; their hilum-like scars, and distinct pits [ibid., x, p. 693]; their larger dimensions, irregularity, relative scarcity, and Hay's brown or tawny coloration; and the slow growth and failure to form sclerotia in the mango fungus at 35° to 35·5°.

The pathogenicity of the mango strain of *S. delphinii* to mango seedlings was proved by inoculations at the stem bases with the mycelium and sclerotia from cultures and by planting the seeds in naturally infected soil. Other plants to which the organism was destructive in inoculation tests included cowpea, *Lagenaria leucantha* [*L. vulgaris*], *Luffa acutangula*, *Cucurbita maxima*, pepper (*Capsicum annuum*), eggplant, radish, and cabbage. In comparative inoculation tests with *S. delphinii* from mango and *S. rolfsii* from pepper, rice, and tomato, the former proved equally aggressive with the latter on young seedlings of mango, papaw, cabbage, radish, tomato, mustard, *Momordica charantia*, and rice.

Under dry conditions the sclerotia of *S. delphinii* were found to remain viable for over a year, and the fungus seems to persist indefinitely in moist nursery soil. Adequate control may be effected by strict sanitation and suitable cultural practices.

BANERJEE (B. N.), KARMARKAR (D. V.), & ROW (G. R.). **Investigations on the storage of Mangoes.**—*Agric. and Live-stock in India*, iv, 1, pp. 36–53, 1934.

From the results [which are discussed and tabulated] of the writers' investigations (1930–3) on mango storage at Bangalore, it appears that the growth of the putrefactive bacteria and fungi (e.g., *Aspergillus niger*) is at a standstill during the earlier stages at 0° C. As the fruit ripens, however, and the sugar content increases, the low temperature alone may not be a sufficient deterrent, and the utilization of ethylene gas [*R.A.M.*, xii, pp. 20, 103] or acetaldehyde vapour [ibid., xii, pp. 46, 565] should then be considered as a supplementary measure.

RAISTRICK (H.) & SMITH (G.). **Studies on the biochemistry of micro-organisms. XXXV. The metabolic products of Byssochlamys fulva Olliver and Smith.**—*Biochem. Journ.*, xxvii, 6, pp. 1814–1819, 1933.

Byssochlamys fulva Olliver & Smith, a fairly common agent of spoilage in processed fruits in England [*R.A.M.*, xiii, p. 36], was grown at 24° on Czapek-Dox solution, on which it produced yields of mannitol equivalent to 30 per cent. of the sugar consumed. A new mould product, byssochlamic acid, $C_{18}H_{20}O_6$, M.P. 163·5°, was isolated to the extent of about 0·5 per cent. from the metabolism solution and proved to be toxic to mice.

BUTLER (O.). **Burgundy mixture.**—*New Hampshire Agric. Exper. Stat. Techn. Bull.* 56, 26 pp., 1933. [Received March, 1934.]

A study [the results of which are tabulated and discussed with numerous references to the relevant literature] of the different ratios of copper sulphate to crystallized sodium carbonate used in preparing Burgundy mixture showed that while mixtures made with different ratios all deteriorate on standing, the least stable are those in which the ratio lies between 1 : 1·15 and 1 : 1·5, the usual ratio range in practice [*R.A.M.*, viii, p. 552]. Within the usual ratio range the ratio of copper sulphate to crystallized sodium carbonate has more effect on stability than has strength in copper sulphate. The method of mixing the copper sulphate and sodium carbonate solutions only slightly effects the density of the precipitate, but the use of cold water is not recommended as it increases the amount of soluble copper present. In Burgundy mixture freshly made within the usual ratio range the percentage amount of soluble copper is within the tolerance of plants on which copper sprays can ordinarily be used; in dried mixtures within the range 1 : 0·9 and 1 : 1·84 it is much below this point and cannot be considered as a source of danger. Tartaric acid, citric acid, and sodium arsenite are effective stabilizers of Burgundy mixtures which, made with a 1 : 1 ratio and stabilized with 0·2 per cent. tartaric acid or 0·6 per cent. citric acid become free from soluble copper after standing; made with a 1 : 1·84 ratio and stabilized with 0·01 per cent. tartaric acid or 0·02 per cent. citric acid Burgundy mixtures contain under 0·0005 per cent. soluble copper. The addition of acid lead arsenate very slightly, and that of calcium arsenate very materially, reduces the percentage amount of soluble copper present. Mixtures with ratios of 1 : 1 and 1 : 1·84 are equally translucent, but those with a 1 : 1 ratio are less conspicuous after drying on the plant.

A Burgundy mixture with a 1 : 1 copper sulphate to crystallized sodium carbonate ratio meets all practical requirements.

HORSFALL (J. G.). **Zinc oxide as a seed and soil treatment for damping off.**—Abs. in *Phytopath.*, xxiv, 1, p. 12, 1934.

Red copper oxide [*R.A.M.*, xii, p. 232] has not proved altogether efficacious in the control of post-emergence damping-off of greenhouse plants caused by *Pythium ultimum* [ibid., xii, p. 643], against which zinc oxide (10 to 20 gm. per sq. ft.) has given very

satisfactory results on a commercial scale in New York. The poor penetrative capacity of this substance may be improved by its admixture with the covering soil or use with a seed treatment. Injury may result from the application of zinc oxide to transplanted seedlings.

WOODMAN (R. M.) & BARNELL (H. R.). **Wetting, spreading, and emulsifying agents for use with spray fluids. VII. The effect of gelatin on water losses from leaves.**—*Journ. Soc. Chem. Ind.*, lii, 43, pp. 352T–354T, 1933.

A brief account is given of laboratory tests with cut leaves of the cherry-laurel, the results of which indicated that the injurious effect that might be expected from gelatine films, of a thickness comparable to those that are formed after the application of a fungicidal spray containing gelatine as a spreader, in checking the loss of water from the leaves, is, in fact, statistically insignificant. It is believed, therefore, that the addition of gelatine or glue to a spray liquid is not likely to interfere with the normal transpiration of the leaves either by clogging the stomata or by preventing cuticular transpiration.

BOUTARIC (A.). **Sur l'appréciation du pouvoir mouillant des solutions ou des bouillies utilisées en agriculture.** [On the evaluation of the wetting capacity of the solutions or mixtures used in agriculture.]—*Comptes rendus Acad. d'Agric. de France*, xix, 29, pp. 1013–1020, 1933.

In this paper (to which P. Viala contributes an introductory note) the writer criticizes the methods in current use for the evaluation of the wetting capacity of fungicides and other materials used in spraying [*R.A.M.*, xi, p. 663; xiii, p. 45].

BAUDYŠ (E.). **Použití dusíkatého vápna v ochraně rostlin.** [The use of calcium cyanamide in plant protection.]—Pamphlet issued by the Agric. Exper. Stat. in Brno, (2nd augmented edit.), 48 pp., 25 figs., 1933.

The purpose of this pamphlet is to bring to the notice of practical agriculturists in Czecho-Slovakia the encouraging results obtained abroad and at home in local experiments in the use of calcium cyanamide for the control of a wide range of bacterial and fungal diseases of cultivated plants, and also of soil insects and weeds. The paper contains a fairly full list of the diseases and pests which have been shown to be amenable to control by this means, and special mention is made of the fungicidal action of calcium cyanamide on the spores of cereal rusts [*Puccinia* spp.], smuts [*Tilletia* and *Ustilago* spp.], and snow moulds (*Fusarium* spp.), hop powdery mildew (*Sphaerotheca humuli*), and the like. It also includes instructions for the correct dosages and times of applications.

JUHANS (J.). **Meie seemnehaigustest.** [Concerning seed-borne diseases.]—*Mitteil. Phytopath. Versuchsstat. der Univ. Tartu* No. 19, 13 pp., 1934. [German summary.]

This is a brief annotated list of the chief seed-borne diseases of economic crops which were observed by the author since 1927 in

the Esthonian branch of the International Seed Testing Association in Tartu [formerly Dorpat], and among which the following may be mentioned. *Botrytis anthophila* [see above, p. 381] was frequently observed on red clover [*Trifolium pratense*] seed imported from Poland, Lithuania, and Livonia, but rarely on seed of home production; the disease caused by the fungus appears, however, to have gained some ground in the south of Esthonia. *Colletotrichum lini* [*R.A.M.*, xiii, p. 372] was found on locally grown flax seed. Cruciferous seeds were found to be contaminated with spores of certain species of black moulds considered to be parasitic, e.g., *Alternaria brassicae* and *A. circinans* [ibid., xiii, p. 204]. Species of *Macrosporium* (which are believed probably to include conidial forms of *Pleospora herbarum*) occur very frequently and in large numbers on home-grown clover seeds.

IVANOFF (S. S.). **A plant inoculator.**—*Phytopath.*, xxiv, 1, pp. 74–76, 1 fig., 1934.

Details are given of an inoculator, consisting mainly of a hollow needle with a lateral opening, a barrel, and an air valve to regulate the outflow of the inoculum, which has been specially devised for the simple, rapid, and uniform infection of maize plants with the agent of bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xiii, p. 298]. Using this instrument, over 100,000 plants were inoculated by four men in four days in 1933.

BLATTNÝ [C.]. **Vertikálni rozšiřeni virových chorob.** [Vertical spread of virus diseases.]—*Ochrana Rostlin*, xiii, 3–4, p. 145, 1933.

A few notes are given on the occurrence in 1933 of some virus diseases of cultivated and wild plants in the highlands of Slovenia. Mosaic of the stinging nettle (*Urtica dioica*) was found as high as 1,550 m. above sea level. Potatoes grown at an altitude of 1,050 m. suffered as much from mosaic and leaf curl as those which grew at from 800 to 1,000 m. Up to an altitude of 900 m. virus diseases were very prevalent and severe on a wide range of hosts, special mention being made of a vein mosaic of the barberry (*Berberis vulgaris*) which reduced the affected plants to complete sterility.

GÄUMANN (E.). **Neuere Erfahrungen auf dem Gebiete der pflanzlichen Immunitätslehre.** [Recent experimental work relating to the science of plant immunity.]—*Verh. Schweiz. Naturforsch. Gesellsch.*, cxiv, pp. 197–219, 1 fig., 4 graphs, 1933.

Summing up his interpretation of recent experimental work in the realm of plant immunity [cf. *R.A.M.*, xiii, p. 318], the writer considers that it is firmly established that certain plants are capable of forming antibodies and of exhibiting a biochemical immunity reaction which, however, is strictly local and not systemic. He points out some outstanding differences and analogies between plant and animal reactions to parasitic infection. In plants the parasite is for the most part actively aggressive [cf. ibid., xiii, p. 293], and the passive resistance of the host is a much more important element in its protection than the 'immune reaction' or active defence. In man and the warm-blooded animals, on the

other hand, the parasite is generally conveyed quite passively into the blood stream, where it meets with active resistance from the immunizing mechanism of the host. In addition, however, to these general humoral reactions which are restricted to the blood stream and thus specific to animals, the latter are also possessed of a concealed local cellular immune reaction, probably constituting a far-reaching analogy with the corresponding phenomenon in the vegetable kingdom.

HAENSELER (C. M.) & ALLEN (M. C.). **Toxic action of Trichoderma on Rhizoctonia and other soil fungi.**—Abs. in *Phytopath.*, xxiv, 1, p. 10, 1934.

Trichoderma [? *lignorum*] added to a soil heavily infested with *Rhizoctonia* reduced seed decay and damping-off on cucumbers and peas from 67 and 63 to 12 and 38 per cent., respectively, the corresponding decreases on *Pythium*-infested soil being from 69 and 77 to 12 and 47 per cent. A liquid nutrient medium, in which the fungus had grown for five days, proved lethal to *Rhizoctonia* and *Pythium* after passage through a filter. The toxic properties of the filtrate were destroyed by heating for ten minutes at 80° C., ageing in cotton-plugged test tubes or flasks for ten days, or bubbling oxygen through the medium for five minutes. The antagonism manifested by *Trichoderma* towards *Rhizoctonia* and possibly other soil pathogens may thus be partially attributable to the toxic action of its metabolic products [cf. *R.A.M.*, xii, p. 534].

FEHMI (S.). **Beiträge zur Kenntnis der Wechselbeziehungen zwischen Kulturpflanzen, ihren Parasiten und der Umwelt. (5. Mitteilung.) Untersuchungen über den Einfluss der Ernährung auf die Empfänglichkeit der Kartoffelknolle für Lagerparasiten und die Änderungen des enzymatischen Stoffwechselverlaufes während der Lagerung.** [Contributions to the knowledge of the interrelations between cultivated plants, their parasites, and the environment. (Note 5.) Investigations on the influence of nutrition on the susceptibility of the Potato tuber to storage parasites and the changes in the course of enzymatic metabolism during storage.]—*Phytopath. Zeitschr.*, vi, 6, pp. 543–588, 3 figs., 10 graphs, 1933.

Continuing the investigations initiated by Schaffnit at the Bonn (Rhine) Phytopathological Institute on the influence of environmental factors on the parasites of cultivated plants [*R.A.M.*, x, p. 478], the writer studied the part played by nutrition in the reaction of potato tubers to certain storage pathogens. Incorporated in the results are some unpublished data obtained by Frl. H. Farries in a preliminary investigation in 1929. The tubers tested were partly from pot cultures and partly from permanent field plots, in which the supplies of the principal nutrients were varied.

Two strains belonging to the *Bacillus phytophthorus* group were used in the experiments, viz., *B. phytophthorus* from C. Stapp, Berlin-Dahlem, and *B. atrosepticus* from the Centraalbureau voor Schimmelcultures, Baarn. There were no macroscopic differences between the two strains, but the latter was found to liquefy gelatine

more rapidly while the former produced a more virulent type of decay [ibid., viii, p. 396]. Neither strain caused infection of unwounded tubers (Modrows Industrie) kept at 10° C. with a relative atmospheric humidity of 80 per cent., irrespective of the nutrition of the plants. Under adverse respiratory conditions (high atmospheric humidity and damp storage) infection developed on uninjured tubers, the susceptibility of which, however, was not appreciably influenced by nutritional factors. Unwounded tubers contract infection by *B. phytophthorus* almost exclusively through the eyes. The thickness of the cork layer is of importance only in so far as a thicker skin gives greater protection against invasion through wounds. The thickest cork layers were formed by tubers from plants supplied with an excess of phosphoric acid and little nitrogen. Resistance (gauged by the reaction of the middle lamella to bacterial invasion) was highest in the tubers from plants receiving an excess of potash (kainit) and no phosphoric acid or nitrogen and lowest in those manured with ammonium sulphate or potassium nitrate. The heaviest storage losses (20·8 and 17·5 per cent. decay) occurred among the tubers from plants manured with an excess of ammonium sulphate and calcium cyanamide, respectively, and the smallest (2·8 per cent.) in the series deprived of nitrogen. Of the 36 potato varieties tested for their reaction to the two above-mentioned bacterial strains, Rotkaragis, Prozentragis, Deodara, and Beseler were the most resistant to the spread of infection, and Eigenheimer, Gelbkaragis, Böhms Edeltraut, and Silesia the least so. Resistance to the dry rot caused by *Fusarium coeruleum* was also highest among tubers from plants receiving an excess of potash and no nitrogen, and lowest in those deprived of potash.

The three metabolic processes of transpiration, starch conversion, and respiration were distinctly influenced by the nutrition of the tubers. The highest total loss of carbohydrates occurred among those given an excess of nitrogen and insufficient potash and the lowest in the series receiving a scanty supply of the former. The metabolic differences induced by varying nutritional systems did not, however, persist in the progeny of the experimental material.

It is apparent from the author's data that an unbalanced nitrogen supply and a shortage of potash must be avoided in the potato-manuring programme. The absolute exclusion of nitrogen is impracticable on a large scale owing to the accompanying reductions of yield, but it should definitely be kept at a minimum in relation to the other constituents of the fertilizer.

SCHULTZ (E. S.), BONDE (R.), & RALEIGH (W. P.). **Components of Potato mild mosaic.**—Abs. in *Phytopath.*, xxiv, 1, p. 17, 1934.

Mild mosaic, manifested by irregular, pale green spots, and slight wrinkling on Green Mountain potatoes [*R.A.M.*, xii, p. 612], has been found to consist of two components, viz., a latent one masked in Green Mountain and many other varieties, and another causing the development of pale green, slightly rugose leaves on a seedling resistant to the latent component and on a virus-free Green Mountain seedling. Aphids transmit the second component, but not the latent one [cf. ibid., xiii, p. 49], separation being

further effected by a seedling potato taking the former but not the latter. Mild mosaic was induced in Green Mountains by inoculation with both components, while plants already harbouring the latent principle contracted the disease on inoculation with the active one.

LIST (G. M.) & DANIELS (L. B.). **A promising control for psyllid yellows of Potatoes.**—*Science*, N.S., lxxix, 2039, p. 79, 1934.

The estimated reduction of the 1932 potato crop in Colorado from psyllid yellows [*R.A.M.*, xiii, p. 151] was 8 million bushels. No evidence has so far been obtained in support of the bacterial or virus theories of the origin of the disease, which appears more likely to arise from a toxin injected into the plants by the psyllid, *Paratrioza cockerelli*, in the course of feeding. Very promising results in the control of yellows have been given by a single spraying with lime-sulphur (33° Baumé) at the rate of 1 in 40, for the destruction of the insects.

BRAUN (H.). **Pfropfenbildung in der Kartoffelknolle.** ['Pfropfen' formation in the Potato tuber.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 1, pp. 24–35, 2 figs., 1934.

During 1933 the writer, in the course of his official inspections of German seed potato stands, was obliged for the first time to refuse certification on account of 100 per cent. 'Pfropfenbildung' [*R.A.M.*, xi, p. 199] in the Ebstorf Goldfink and Industrie varieties. This condition, so named because the compact wad of necrotic tissue can be drawn out of the tuber like a cork, has hitherto been practically ignored in Germany as a possible cause of serious injury. Only Hiesch (*Pflanzenbau*, ix, p. 104, 1932) appears to have recognized the severity of the disease in Hanover, where in 1929 healthy seed outyielded the affected by 35 per cent.

The symptoms of the disturbance are briefly described and the question of its synonymy discussed at some length. It is very difficult to interpret the exact meanings of the various writers on necroses of this type, but it appears certain that 'Pfropfenbildung' is synonymous with the Dutch 'kringerigheid', 'kranzigheid', or 'veekkerigheid' and the English 'spraing' [*R.A.M.*, xii, p. 653]. The relationship of 'Eisenfleckigkeit' or 'Buntfleckigkeit' to 'kringerigheid' is not clear, while further confusion is introduced by the use of the term 'internal rust spot' for distinct disorders [ibid., xi, p. 320] which have no connexion with the condition under discussion. 'Pfropfenbildung' was first observed in Holland at the turn of the century, possibly by R. Bos in 1898–9 (*Landbouw Tijdschr.*, 1899). In Germany the first record of the disease dates from 1910, about which time it was also reported from England under the name of 'sprain' (*Journ. Board Agric.*, xvi, pp. 33, 647, 1909–10).

The damage caused by 'Pfropfenbildung' involves both the culinary qualities of the tubers and their utility for seed purposes. Cases are known in which an entire crop from selected seed had to be used for fodder, while Hiesch found that affected tubers are particularly liable to storage rots and germinate poorly. There is no real evidence that 'Pfropfenbildung' is hereditary, and its

occurrence seems to be correlated to some extent with weather and soil conditions, its development being favoured by a hot, dry summer and an abundance of sand or gravel in the soil. The underlying cause of the disturbance, however, remains obscure, Quanjer's attempts to isolate an organism from diseased material having failed [*R.A.M.*, v, p. 573] and no actual proof being available of the implication of environmental factors. In these circumstances no definite measures for combating 'Pfropfenbildung' can be formulated beyond the ordinary rules of plant hygiene, possibly supplemented by the development of resistant varieties, but in the latter connexion more consistent information is required.

VAN DER PLANK (J. E.). **Internal brown fleck of Potatoes.**—*Farming in South Africa*, viii, 91, pp. 383–384, 1 fig., 1933.

All varieties of potatoes grown in South Africa appear to be susceptible to internal brown fleck which, however, is confined to acid sandy soils, and the application of lime, at the rate of 1,000 to 2,000 lb. per half morgen, usually gives good control, the beneficial effects persisting for five to ten years. Superphosphates are also useful in checking the tendency to internal brown fleck, which is promoted, on the other hand, by ammonium sulphate. Flecked seed has been found to produce a clean crop on suitable soil, whereas clean seed can give a diseased stand on unsuitable ones. From the evidence at present available internal brown fleck does not seem to be infectious.

MITRA (A.). **A new wound parasite of Potato tubers.**—*Nature*, cxxxiii, 3350, p. 67, 1934.

The writer inoculated monospore cultures of *Fusarium viride* (renamed by Wollenweber [*R.A.M.*, x, p. 626] *F. solani* var. *medium*) into potato tubers at Allahabad, India. After 24 days at a temperature of 20° to 25° C. all the inoculated tubers showed an advanced dry rot with a wrinkled sunken patch and whitish pustules on the surface near the plug. *F. solani* var. *medium* was reisolated in pure culture from the infected areas. Negative results were given by inoculation with *F. moniliforme* [*Gibberella moniliformis*], *F. camptoceras*, *F. diversisporum*, and *F. semitectum* and its var. *majus* [ibid., xiii, p. 128]. All the controls remained healthy.

This appears to be the first record of *F. solani* var. *medium* as a parasite of the potato.

POOLE (R. F.). **Sweet-Potato ring rot caused by Pythium ultimum.**—Abs. in *Phytopath.*, xxiv, 1, p. 16, 1934.

Pythium ultimum [see above, p. 388] was found to be the cause of a soft, ring-like decay of sweet potatoes, proceeding from one side of a root to the other without involving all the tissues. The fungus produces amylase, pectinase, and protease. Rotting occurs in 26 to 48 hours and complete rings are formed in three days in a saturated atmosphere at 20° C. Ring rot developed in all the commercial sweet potato varieties tested, Jersey and Nancy Hall

being apparently the most susceptible. Severe infection occurred on crops harvested after the heavy autumn rains.

TULLIS (E. C.) & CRALLEY (E. M.). **Laboratory and field studies on the development and control of stem rot of Rice.**— *Arkansas Agric. Exper. Stat. Bull.* 295, 23 pp., 6 figs., 1933.

A comprehensive account is given of the writers' laboratory and field studies in Arkansas on the life-history and control of stem rot of rice (*Leptosphaeria salvinii*) [*R.A.M.*, xiii, p. 322].

The symptoms of the disease are described and the taxonomy of the causal organism briefly discussed. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be below 13°, 25° to 30°, and 32° to 35° C., respectively, and the optimum hydrogen-ion concentration ranged from P_H 6·5 to 8. Three definite stages may be recognized in the invasion of the rice tissues and subsequent collapse of the culm, the first represented by the production of small, black lesions on the outer leaf sheaths, the second by the infection of the culm, and the third by invasion of the central cavity of the latter. In the initial phase the mycelium may be found throughout the invaded tissues, hyphal mats occurring on the inner surfaces of the sheaths and appressoria on the outer ones. During this stage many tillers are attacked and killed. The second stage of invasion coincides with the abundant production of mycelium and appressoria over the culm surface. Above this growth are formed patches of dense sclerotial masses, evidently containing a pectin-dissolving enzyme which affects the underlying sclerenchymatous tissue. At this juncture small mycelial branches force their way into the culm between the epidermal cells and the outer layers of sclerenchyma, or sometimes through the pits. On reaching a vascular bundle the fungus makes a rapid longitudinal and radial advance into the culm, accompanied by browning of the cells and disintegration of their contents. Ultimately a cottony mycelial weft is produced throughout the internodal cavity, and the invasion of the parenchyma of the culm soon completes the destruction of all but the outer sclerenchyma. The weakening of the culm due to the dissolution of the parenchyma causes its collapse.

The perfect stage has only been found on cultivated rice, but the conidial stage (*Helminthosporium sigmoideum*) occurs also on *Zizaniopsis miliacea*, while the sclerotial stage (*Sclerotium oryzae*) has in addition been observed on the short barnyard grass *Echinochloa colona* [*Panicum colonum*]. The sclerotia are responsible for primary infection and also for the perpetuation of the fungus over a lengthy period (several years). The conidia cause primary and also secondary infection. The role of the ascigerous stage in the life-history is as yet unknown, but the ascospores remain viable for at least a year in the laboratory, and if the perithecia overwinter on stubble they may also be a source of primary infection in the following season.

Of the various control measures discussed in some detail, the most promising appears to be the withholding of standing water from the fields for a time prior to maturity, though enough should

be present to keep the ground muddy throughout the growing season.

NISIKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Reports on the physiologic specialization of Fusarium. I. On the differentiation of the pathogenicity among the strains of Rice-'bakanae'-fungus. II. Temperature relations to the growth of the Rice-'bakanae'-fungus.**—*Ber. Ôhara Inst. Landw. Forsch.*, vi, 1, pp. 113–147, 1 graph, 1933.

The results of the writers' studies on physiologic specialization and temperature relations in the 'bakanae' fungus of rice (*Lisea* [*Gibberella*] *fujikuroi*), which are here presented in a comprehensive form and supplemented by 18 tables, have already been noticed in this *Review* from other sources [*R.A.M.*, xii, p. 719; xiii, p. 323].

HOERNER (G. R.) & JONES (W.). **Crown treatments for Hop downy mildew control.**—*Phytopath. Zeitschr.*, vi, 6, pp. 619–626, 1933.

The information in this paper on the successful control of hop downy mildew (*Pseudoperonospora humuli*) in British Columbia and Oregon by spring treatment of the crowns with copper-containing dusts has already been summarized from another source [*R.A.M.*, xii, p. 325].

BLATTNÝ (C.). **Kažení barvy, vůně a ostatních vlastností Chmele (Humulus lupulus).** [Spoilage of the colour, odour, and other properties of Hops (*Humulus lupulus*).]—*Ochrana Rostlin*, xiii, 3–4, p. 144, 1933.

The examination of samples of hops stored for three years in Czecho-Slovakian warehouses showed the abundant presence on them of black moulds, chiefly *Cladosporium* and *Hormodendron* species, which materially affected the keeping qualities of the product, and to a lesser extent of species of *Botrytis*, *Penicillium*, and *Rhizopus*; bacteria were very poorly represented. It was noticed, however, that hops that had been treated with Bordeaux mixture against downy mildew [*Pseudoperonospora humuli*] suffered considerably less in storage from the black moulds.

CURZI (M.). **Il deperimento del Piretro nell' isola di Cherso.** [The wilt of Pyrethrum in the island of Cherso.]—*Boll. R. Staz. Pet. Veg.*, N.S., xiii, 4, pp. 537–553, 4 figs., 1933. [English summary.]

The plantations of pyrethrum (*Chrysanthemum cinerariaefolium*) growing in the island of Cherso in the Adriatic have during the past twelve years become affected by a wilt which has grown progressively worse, increasingly curtailing the life of the crop. The affected plants show a reduced development of the aerial parts, flower production declines, the leaves are under-sized, yellowish, and dry up, and finally the whole plant wilts and dies. Wilted plants are almost devoid of secondary roots, those found being discoloured and rotted. Sections of the discoloured roots of affected plants constantly showed the presence of species of

Fusarium, mostly belonging to the section *Martiella*. In some of the roots *F. javanicum* var. *radicicola* was actively parasitic, and this fungus is regarded as the cause of the disease on those plants on which it was found. Another *Fusarium*, also parasitic on this host, and morphologically similar to, though having different cultural characters from, *F. javanicum* var. *radicicola*, was also isolated.

The author considers that the disease, which has been favoured by unsuitable cultural practices, is a fusariosis probably due to more than one species or strain of *Fusarium*. Further investigations on this point are in progress.

The paper terminates with notes on control by improved sanitary methods.

Results from imported Canes.—*South African Sugar Journ.*, xvii, 11, pp. 573–575, 577, 3 figs., 1933.

In connexion with a report on certain properties of nine imported sugar-cane varieties which have been under experimental observation at the farm and factory of V. Crookes, a leading Natal agriculturist, the value of interplanting maize with the canes as a protection against streak [*R.A.M.*, xiii, p. 126] is emphasized. Although opposed to the hitherto recognized scientific practice, this method is stated to have reduced the incidence of infection to between 2·5 and 5 per cent.—alleged to be the lowest in the industry. The jassid [*Cicadulina mbila*] responsible for streak transmission prefers to feed on the maize, and by the time the latter has been harvested the winter is approaching and the insect remains dormant until the spring, when the canes are sufficiently vigorous to withstand its depredations.

MATZ (J.). **Relative infectivity of mosaic virus extracted from various parts of Sugarcane.**—Abs. in *Phytopath.*, xxiv, 1, pp. 14–15, 1934.

Using improved methods for the inoculation of sugar-cane with juice extracted from mosaic plants [*R.A.M.*, xii, p. 660], the writer made tests to determine the possible existence, in a diseased individual, of specific regions wherein the activity of the virus is to some extent inhibited. It was found that, in a given shoot, the juices from infected expanded lamellae of young and mature green leaves, midribs, leaf sheaths, and true stems, separately, show an equal degree of infectiousness (80 to 100 per cent.), whereas in a parallel series of inoculations a relatively low measure of virulence (0 to 50 per cent.) characterized the juices from the rolled inner white and brittle portion of the leaf bases in the lower region of the bud. There was no reduction of virulence on adding equal portions of the juice from the latter region or from the healthy green foliage to virulent green leaf juice.

MCCLEAN (A. P. D.). **Cold chlorosis or sectional chlorosis of Sugar Cane.**—*South African Sugar Journ.*, xviii, 1, p. 31, 1934.

A further brief note is given on the occurrence of cold chlorosis of sugar-cane in Natal and Zululand [*R.A.M.*, xiii, p. 126], where

a minimum temperature of 13° C. is apparently necessary for its development. The injury resulting from this disturbance is stated to be of little or no importance, and in any case there is no practical means of avoiding it.

SAWADA (K.). **Descriptive catalogue of the Formosan fungi. Part VI.**—*Rept. Dept. Agric. Res. Inst. Formosa*, 61, 117 pp., 2 pl., 1933. [Received April, 1934.]

A number of interesting fungi are described in Japanese as new, including *Oidiopsis capsici* [*R.A.M.*, xi, p. 183] on *Capsicum annuum*, *O. papaveris* on *Papaver somniferum*, *Cicinnobolus nicotianae* on *Oidium* of *Erysiphe nicotianae*, *Colletotrichum medicaginis-denticulatae* on *Medicago denticulata*, *Sclerotium cinnamomi* on *Cinnamomum camphora*, and several species of *Oidium*. Illustrations are given of a number of species, including most of the above and also *Phakopsora sojae* (P. Henn.) Saw. (syn. *Uredo sojae* P. Henn.) on soy-bean, *Ramularia citrifolia* Saw. on *Citrus* sp., and *Septobasidium citricolum* on *C.* spp. English fungus and host indices are appended.

LIND (J.). **Studies on the geographical distribution of Arctic circumpolar Micromycetes.**—*Danske Vidensk. Selsk. Biol. Meddel.*, xi, 2, 152 pp., 1934.

A list, supplemented by critical and taxonomic observations and by a five-page bibliography, is given of 422 species of fungi observed by the writer in a personal examination of the Arctic plant collections deposited during the past 60 years at the Copenhagen Botanical Museum [cf. *R.A.M.*, xii, p. 469]. The present work is stated to be the first attempt to assemble the scattered records of Arctic mycological investigations and so obtain continuity in the knowledge of the distribution of fungi in the countries concerned.

No genus of fungi appears from the author's studies to be strictly endemic in the northern Polar region. A high percentage of the species under observation are known both from the Arctic and the Alps, and it is of interest to note that the fungi capable of flourishing in the aridity of the far north are usually widespread over the globe [cf. ibid., xii, p. 579].

FRANÇAIS (J.). **Observations mycologiques et essais microphotographiques.** [Mycological observations and microphotographic experiments.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 6–7, pp. 261–268, 2 pl., 1933. [Received March, 1934.]

After describing a staining technique which showed the presence of starch in the hypertrophied tissues of pear leaves surrounding the aecidia of *Roestelia cancellata* [*Gymnosporangium sabinae*: *R.A.M.*, xi, p. 799], the author states that after a hot, dry summer the berries and stalks of a vine near Epinal bore numerous perithecia of *Uncinula spiralis* [*U. necator*: ibid., x, p. 641] measuring 90 to 120 (average 103) μ in diameter, furnished with 10 to 40 (average 17 to 23) septate appendages 4·7 μ wide, and containing 6 piriform asci 54 by 39 μ, each with 6 ascospores 15 by 10 μ.

Salix purpurea trees near Epinal were severely attacked by *U. salicis* [ibid., xii, p. 666].

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Le cycle évolutif des Actinomyces dans les cultures après passage à travers l'ultra-filtre de collodion.** [The evolutionary cycle of *Actinomyces* in culture after passage through a collodion ultra-filter.]—*Comptes rendus Acad. des Sciences*, cxcvii, 23, pp. 1465–1467, 1933.

Using Malfitano's and Sigaud's technique (*Ann. Inst. Pasteur*, xliii, p. 190, 1929), the writers subjected to ultrafiltration through collodion sacs cultures of *Actinomyces bovis* and of a strain of *Actinomyces* of proved pathogenicity to man [*R.A.M.*, xi, p. 514]. The organisms developed intra-filtrating corpuscles; 'symplasts' or swollen, amorphous, Gram-negative rods with minute, Gram-positive granules at the limit of visibility, presumably nuclear vestiges; a pseudodiphtheric stage consisting of Gram-positive rod- or club-shaped, irregular, connected, branched elements; a pseudostreptococcic phase; a biodynamogenic stage (formed in cultures of three weeks old and upwards on liquid Sabouraud's medium with malt at P_H 5·8), represented by long rods containing two large nuclear corpuscles and previously described by Lieske and Antonioli as 'T' or 'double Y' elements; and a stage commencing by longitudinal budding in the manner of *Clostridium* but finally evolving into the typical *Actinomyces* hyphae with arthrospores.

Three of the phases composing this life-cycle are morphologically irreversible, namely, the ultra-filtrating, pseudostreptococcic, and hyphal stages.

DRECHSLER (C.). **Pythium butleri and Pythium aphanidermatum.**—Abs. in *Phytopath.*, xxiv, 1, p. 7, 1934.

In studies of nearly 100 isolations, from various plants, of the *Pythium* type characterized by lobulate sporangia and broadly applied, swollen antheridia, two cultures from diseased tobacco seedlings in Sumatra and three from affected sugar-cane roots in Louisiana appeared to differ from the rest. The zoosporangia were generally smaller and derived from much less swollen and less profusely branched elements. The zoospores were also smaller (9 instead of 11 μ in diameter), with corresponding reductions in the oogonial and oospore dimensions, the former averaging 22 instead of 27 μ and the latter 17·5 compared with 22·5 μ. The antheridium also is smaller and much more frequently produced immediately adjacent to the oogonium. The smaller of these two species is thought to be probably identical with *P. aphanidermatum* and the larger with *P. butleri* [*R.A.M.*, xii, pp. 450, 723].

HOLMES (F. O.). **Masked strain of Tobacco-mosaic virus.**—Abs. in *Phytopath.*, xxiv, 1, pp. 11–12, 1934.

A strain of the tobacco mosaic virus, the effects of which are masked in *Nicotiana tabacum*, resembles the ordinary strain in its reactions to heating, storage, and dilution, as well as in its host range. In all necrotic type hosts the primary lesions of both strains are indistinguishable in appearance, whereas in those

developing systemic necrosis or intense yellowing [*R.A.M.*, xiii, p. 330] the symptoms of the masked strain are less severe. Hosts in which mottling is induced by the ordinary strain serve as symptomless carriers of the masked one. In tobacco both the masked and ordinary strains of the mosaic virus cause abnormal starch retention in recently affected leaf tissues. The systemic spread of the virus is less extensive in plants infected by the masked strain.

VINSON (C. G.). **Purification of the virus of Tobacco mosaic.**—Abs. in *Phytopath.*, xxiv, 1, p. 20, 1934.

The infectivity of the juice from mosaic tobacco plants may be increased by the addition of activated charcoal following that of Lloyd's reagent [*R.A.M.*, xii, p. 332]. A small quantity of normal solution of aluminium sulphate forms a flocculent precipitate when added to the virus fraction obtained on decomposing the safranin precipitate of the virus with Lloyd's reagent. This precipitate, containing the infectious agent, packs sufficiently to permit complete decantation of the supernatant liquid, which shows little virulence. Magnesium sulphate may also be used to separate the virus from the above-mentioned fraction, but a much larger quantity of this substance is required.

KUNKEL (L. O.). **Tobacco and aucuba-mosaic infections by single units of virus.**—Abs. in *Phytopath.*, xxiv, 1, p. 13, 1934.

When two samples of tobacco juice containing the viruses of aucuba and tobacco mosaic, respectively, are mixed in equal proportions or otherwise up to one part of either in 30 parts of a mixture, and used for needle inoculations of mature leaves of *Nicotiana langsdorffii*, circular necrotic lesions develop round the sites of infection. By testing on *N. sylvestris* the presence in a given lesion of the tobacco or aucuba mosaic virus or a mixture of the two was demonstrated, the mixture being only seldom recovered. Each virus being readily transmissible by the needle-puncture method, it would seem that in the great majority of cases infection was due to a single virus unit, the resultant lesions being comparable to bacterial colonies isolated by the Koch-plate method.

JOHNSON (B.). **Concentration of the virus of the mosaic of Tobacco.**—*Amer. Journ. of Botany*, xxi, 1, pp. 42–53, 1934.

A direct current of 110 volts was found to induce the rapid precipitation of part of the substances present in the juice of mosaic plants, while leaving the virus in suspension. Ammonium sulphate proved to be the most suitable of the salts used for the partial salting out of the virus, having the least inactivating effect and inducing the most thorough precipitation. Certain activated carbons, e g., nuchar 00, at low concentrations (2·5 per cent.) may be used to clarify the juice of mosaic plants, at the same time leaving the virus in suspension. Details are given of a method for the preparation of highly concentrated and partially purified suspensions of the mosaic virus [cf. *R.A.M.*, xii, p. 648; xiii, p. 328]. A definite difference was observed in the protein reactions of the concentrated juice from healthy and diseased plants, and it appears

very probable that the virus must be concentrated before any protein present in it can be detected.

BECHHOLD (H.) & SCHLESINGER (M.). **Grösse von Virus der Mosaikkrankheit der Tabakpflanze.** [The size of the virus of the mosaic disease of the Tobacco plant.]—*Phytopath. Zeitschr.*, vi, 6, pp. 627–631, 1933.

The writers' protracted investigations [details of which are given] at the Frankfurt-am-Main Colloid Research Institute have shown that the tobacco mosaic virus consists of particles about 50 $\mu\mu$ in diameter [*R.A.M.*, xii, p. 309], i.e., approximately the same as a medium-sized bacteriophage and considerably smaller than those determined by the authors for the smallpox, herpes, canary, and fowlpox viruses (200, 200, 120, and 110 $\mu\mu$, respectively). The centrifuging method employed in these determinations is stated to have been fully described in the authors' papers on the animal viruses (cf. *Zeitschr. für Hygiene*, cxv, p. 342, 1933).

HENDERSON (R. G.). **Effect of air temperature on Tobacco ring-spot infection.**—Abs. in *Phytopath.*, xxiv, 1, pp. 10–11, 1934.

It was shown by greenhouse and incubator studies that the development of ring-spot symptoms in tobacco [*R.A.M.*, xiii, p. 330], following artificial inoculation, is influenced by the air temperature at which the plants are grown. No symptoms were manifested at temperatures above 93° F., but at 80° to 85° they developed in four to five days. No further signs of infection were shown by plants with primary lesions on the inoculated leaves on transference from a relatively low to a high temperature. On the other hand, plants on which no symptoms had appeared during several days at a high temperature developed primary lesions on removal to a lower one.

Tobacco growers ! Important notice. The 'kromnek' disease of Tobacco.—*Rhodesia Agric. Journ.*, xxi, 1, pp. 9–10, 1934.

Tobacco plants in Southern Rhodesia have recently shown symptoms [which are briefly described] closely resembling those of the virus disease known in South Africa as 'kromnek' or Kat River wilt [*R.A.M.*, xiii, p. 129]. Attempts to ascertain the distribution of the disease are being made, in order that prompt steps may be taken to prevent an epidemic.

CLAYTON (E. E.) & GAINES (J. G.). **Progress in the control of Tobacco downy mildew.**—Abs. in *Phytopath.*, xxiv, 1, p. 5, 1934.

The location of tobacco beds on virgin soil in remote areas, soil sterilization, and seed treatment all proved ineffectual against downy mildew [*Peronospora hyoscyami*: *R.A.M.*, xiii, p. 333] in the United States. Tests of a large number of *Nicotiana tabacum* varieties showed all to be susceptible, the Turkish Xanthia being least affected, while *N. rustica* is resistant. Recovered plants showed a higher degree of resistance to infection than those not previously attacked. Spraying with Bordeaux mixture gave adequate control on very young seedlings, but the outcome of

extensive plant bed trials in 1932–3 at different places in five States are disappointing. None of the other liquid and dry fungicides [which are listed] excelled Bordeaux mixture. Control of the disease was obtained in plant beds heated at night to maintain a temperature of 70° F. or above during the critical period for infection.

HENDERSON (R. G.). **Experiments on the control of downy mildew of Tobacco.**—Abs. in *Phytopath.*, xxiv, 1, p. 11, 1934.

Calcium sulphide (cal-mo-sul) [*R.A.M.*, xiii, p. 310] was the only one of several fungicides tested against downy mildew of tobacco (*Peronospora hyoscyami*) [see preceding abstract] on plant beds in 1933 that gave results approximating to commercial control. Under greenhouse conditions more frequent applications are necessary to ensure a comparable outcome, and this treatment was found to cause a noticeable reduction of growth.

NORTON (J. B. S.) & HUNTER (H. A.). **Tomato diseases and their control.**—*Maryland Agric. Exper. Stat. Bull.* 345, pp. 490–494, 1933. [Received April, 1934.]

This is a brief guide to the more important tomato diseases found in the United States. Numerous bibliographical references (mostly to bulletins published by the American Experiment Stations) are given and the paper terminates with general directions for control.

HEUBERGER (J. W.) & NORTON (J. B. S.). **The mosaic disease of Tomatoes.**—*Maryland Agric. Exper. Stat. Bull.* 345, pp. 447–486, 2 figs., 2 graphs, 1933. [Received April, 1934.]

This account of the authors' investigations of tomato mosaic [the results of which are tabulated, expressed graphically, and fully discussed] deals, among others, with the following points: factors influencing the development of the symptoms, stage when infection occurs, spread during cultural operations, effect on the canning quality of the crop, the drying rates of the leaves, the transpiration rate, method of overwintering of the virus, and control. There is a bibliography of 39 titles.

THORNTON (M. H.) & KRAYBILL (H. R.). **Further studies on a noninfectious leaf-deforming principle from mosaic Tomato plants.**—Abs. in *Phytopath.*, xxiv, 1, p. 19, 1934.

On autolysis of the expressed juice of mosaic tomato plants and the inactivation of the virus by boiling, the juice was found to contain the non-infectious, leaf-deforming principle previously described by Kraybill and collaborators [*R.A.M.*, xi, p. 754]. The activity of the juice was not diminished by precipitation of the proteins with alcohol or acetone or by extraction with ether. Numerous attempts to obtain active preparations from healthy plants gave negative results. Preparations from the fresh juice of tomato plants showing 'fern-leaf' symptoms induced by inoculation with cucumber mosaic were inactive. Tomato plants showing marked symptoms resulting from inoculation with the non-infectious, leaf-deforming principle and those with typical mosaic

were lower in reducing-sugars, sucrose, starch, and hemicellulose, and higher in total and nitrate nitrogen than healthy plants.

KORDES (H.). **Einige Massnahmen des Pflanzenschutzes im Tomatenbau.** [Some plant protective measures in Tomato cultivation.]—*Nachricht. über Schädlingsbekämpf.*, viii, 4, pp. 137–142, 4 figs., 1933. [English summary on pp. 184–185.]

For the control of the tomato diseases caused by *Phytophthora infestans*, *Bacterium* [*Aplanobacter*] *michiganense*, and *Didymella lycopersici* [*R.A.M.*, xii, pp. 662–663], the writer recommends, on the basis of his lengthy experience in the Palatinate, seed treatment with ceresan or tillantin R; the disinfection of trays, hot-bed casings, and the like with 0·25 to 0·3 per cent. uspulun or 0·125 per cent. liquid ceresan and of the sticks for training the plants with 0·5 per cent. formalin; immersion of the seedling roots in a thin clay paste diluted with uspulun or ceresan; and the repeated application to the young plants of a copper mixture (0·5 to 1 per cent.). The last-named measure is ineffectual, however, against bacterial wilt, the transmission of which is effected by the knives or hands in topping the growing plants.

REUSRATH (T.). **Erfolgreiche Bekämpfung der bakteriellen Tomatenwelke und der Tomatenstengelfäule.** [The successful control of bacterial wilt and stem rot of Tomatoes.]—*Ratschläge für Haus, Garten, Feld*, ix, 1, pp. 9–11, 1 fig., 1934.

It is claimed that the serious losses (up to 90 per cent. of the crop) caused in Germany by the tomato diseases due to *Bacterium* [*Aplanobacter*] *michiganense* and *Didymella lycopersici* [see preceding and next abstracts] may be reduced to a minimum by seed disinfection with uspulun or ceresan; dipping of the seedlings before transplanting in a loam emulsion with the addition of 0·5 per cent. each of uspulun and solbar; one hour's immersion of the sticks, &c., used for training the plants in 1 per cent. uspulun; and one or two applications of a mixed spray of uspulun and solbar (0·5 per cent. of each) to the young plants.

KOCH (R.). **Die Behandlung der Tomatenpflanzen mit Uspulun gegen die Tomatenstengelfäule und die bakterielle Tomatenwelke.** [The treatment of Tomato plants with uspulun against Tomato stem rot and bacterial wilt.]—*Ratschläge für Haus, Garten, Feld*, ix, 1, pp. 11–12, 1934.

Since 1930 the writer has conducted a systematic campaign against stem rot [*Didymella lycopersici*] and bacterial wilt of tomatoes [*Aplanobacter michiganense*: see preceding abstracts] with uspulun, employed as follows: 20 minutes' immersion of the seed in a 0·4 per cent. solution; spraying the propagating frame at the same concentration and washing the exterior woodwork at 0·25 per cent.; spraying the glasshouse (inclusive of soil) with a 0·4 per cent. solution, washing the windows at 0·25 per cent., and dipping the strings for training at 0·5 per cent.; spraying the transplanted seedlings at 0·25 per cent. (1) ten days after removal

from the seed-bed and (2) three days before potting; and dipping the plants, immediately prior to planting out in the greenhouse, in a bath containing a 0·25 per cent. solution. In 1930 only 34 out of 1,000 plants thus treated contracted bacterial wilt, as against 155 the previous year, and 32 stem rot; in 1931, 76 out of 3,000 developed wilt and 290 stem rot.

NORTON (J. B. S.). **Fusarium wilt of Tomatoes.**—*Maryland Agric. Exper. Stat. Bull.* 345, pp. 487–489, 1933. [Received April, 1934.]

A brief, popular account is given of tomato wilt (*Fusarium lycopersici*), with notes on its distribution in Maryland and on breeding tests carried out in the United States for the production of resistant varieties [cf. *R.A.M.*, xiii, p. 218].

AGERBERG (L. S.), SCHMIDT (M.), & SENGBUSCH (R. v.). **Der Einfluss künstlicher Kultur auf das Verhalten der Konidien von Cladosporium fulvum.** [The influence of artificial culture on the conidial behaviour of *Cladosporium fulvum*.]—*Planta*, xxi, 3, pp. 511–513, 1933.

Comparative observations on the morphological and physiological characters of *Cladosporium fulvum* conidia direct from tomato leaves and in dextrose agar cultures revealed far-reaching differences. The leaf conidia are longer and narrower than those developing in pure culture, the former being predominantly elongated and non- to biseptate while the latter are mostly uniseptate, broadly oval, and much more regular than on the natural substratum. The germination-inhibiting effect of concentrated solanin solutions [*R.A.M.*, xiii, p. 134, and next abstract] is much less pronounced on the leaf conidia than on those in pure culture, which are affected by this substance at a very low strength. In tomato or potato leaf decoctions the leaf conidia of *C. fulvum* form normal long, sparsely branched hyphae, showing no tendency to the 'antlering' characteristic of 'culture' conidia under similar conditions [loc. cit.]. Only in the expressed sap of tomato leaves do the leaf conidia incline to 'antlering'; this phenomenon may be due to a slight toxic action of the alkaloid at a low concentration, to which in general the 'culture' conidia are particularly susceptible. In leaf decoctions of *Solanum racemigerum* the 'culture' conidia germinate only when the medium is boiled for upwards of ten minutes, whereas those from the leaf germinate consistently irrespective of the boiling period.

Inoculation experiments with conidia from quite young dextrose agar cultures gave negative results on tomatoes, which contracted the usual symptoms of leaf mould on inoculation with leaf conidia.

The resistance of *S. racemigerum* to *C. fulvum* has been shown by anatomical investigation to be due to the failure of the fungus to penetrate the epidermis and stomata. It is, however, capable of living in a saprophytic form on the leaves and producing conidia differing only in their smaller dimensions from those of the parasitic type. The part played by 'prohibitin' [loc. cit.] in the

immunization of *S. racemigerum* against *C. fulvum* cannot be conclusively defined on the basis of these preliminary experiments.

AGERBERG (L. S.), SCHICK (R.), & SENGBUSCH (R. v.). **Die Bestimmung des Solaningehaltes von Pflanzen mit Hilfe von Cladosporium fulvum.** [The determination of the solanin content of plants with the aid of *Cladosporium fulvum.*]—*Der Züchter*, v, 12, pp. 272–280, 8 figs., 1 graph, 1933.

A highly sensitive indicator of minute traces of solanin in a leaf or fruit decoction of tomato or other Solanaceae is afforded by the behaviour of *Cladosporium fulvum* [see preceding abstract] in respect of conidial germination and length and extent of branching of the germ-tubes, the two latter characters being directly correlated. High germination percentages and long germ-tubes denote a low solanin content, low germination and short germ-tubes a high solanin concentration. By the use of this method the writers were able to determine the solanin content of over 100 tomato varieties (including Bonny Best, Danish Export, and Stirling Castle) and a number of other Solanaceae [which are enumerated]. The possibilities of extending the technique and of applying it to the practical aspects of plant breeding are discussed.

VANINE (S. I.). Курс лесной фитопатологии. Часть II. Бактериальные и непаразитарные болезни древесных пород. [Lectures on forest pathology. Part II. Bacterial and non-parasitic diseases of trees.]—150 pp., 87 figs., State Publishing Office of Agric. & Collective Farming Co-operative Literature, Moscow, 1933.

In this, the second part of his text-book on forest pathology [*R.A.M.*, xi, p. 78], the author deals rather summarily with the diseases of forest trees caused by bacteria, actinomycetes, algae, lichens, virus agencies, parasitic phanerogams, and environmental factors, such as noxious gases, factory smoke, unfavourable soil conditions, and the like. A special chapter briefly discusses the injuries of non-parasitic origin to felled and processed timber. The book terminates with an index of the Latin names of the hosts and parasitic organisms dealt with, and also of the foreign names of certain of the diseases.

HARTLEY (C.) & BOYCE (J. S.). **The progress of forest pathology.**—*ex* '**A national plan for American forestry, Senate Document No. 12 (73d Congress)**.—pp. 695–722, 1 diag., U.S. Govt. Printing Office, Washington, 1933.

This account of the organization and progress of the American forest pathology service (in which the writers were assisted by S. B. Detwiler, E. P. Meinecke, W. W. Wagener, R. K. Beattie, L. S. Gill, and other members of the Division of Forest Pathology, Bureau of Plant Industry) is divided into three main sections, viz., forest deterioration by native diseases, the same by introduced diseases, and the present status of research and control. Much of the information here presented has been noticed in this *Review* from various sources.

BIDWELL (C. B.) & BRAMBLE (W. C.). **The Strumella disease in southern Connecticut.**—*Journ. of Forestry*, xxxii, 1, pp. 15–23, 1 fig., 1934.

Strumella corynoidea Sacc. and Wint. is stated to cause a very serious disease of oaks (*Quercus montana*, *Q. velutina*, *Q. borealis*, *Q. coccinea*, *Q. alba*, *Q. bicolor* and *Q. palustris*) in southern Connecticut, and has also been reported from several other States, and from Ontario, Canada, the fungus being probably indigenous to North America. Other hosts include hickory (*Hicoria glabra* and *H. ovata*), beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and chestnut (*Castanea dentata*).

The first symptom is an inconspicuous yellowish discoloration of the bark, usually at the base of a dead branch; on the removal of the outer corky layers covering the lesion, a whitish mycelium may be seen as a thin mat. In the more advanced stages of the disease the lesions may be either of the 'canker' or 'diffuse' type, the former resulting from the annual production of successive ridges of callus as the lesion extends, and the latter developing when the fungus girdles the trunk too rapidly for callus formation. The elliptical cankers of the former type may attain a length of 60 in. and extend 24 in. round the circumference of the trunk. The dark brown, powdery sporodochia, 1 to 3 mm. in diameter, appear in large numbers on and beyond the bark of the original lesion, and produce an abundance of brown, irregularly globose to piriform, echinulate conidia, 7 to 12 by 4 to 7 μ, from the tips and sides of branched, brownish conidiophores. The fungus was readily isolated on various artificial media as well as on red oak-bark extracts but did not fruit in culture.

The percentage of oaks attacked was not observed to exceed 5·5, but seventy per cent. of the cankers occurred on the first 8 ft. of the stem, thereby rendering the butt log partly or wholly worthless. The cambium is killed and the wood underlying the cankers slowly decays. Most of the trees are infected before they reach the age of 20 to 25 years, vigorous individuals being as readily attacked as slow-growing ones. The early removal of diseased material should prevent the spread of infection.

SIBILIA (C.). **Ulteriori notizie sulla resistenza dell' 'Ulmus pumila' a 'Ceratostomella ulmi' Buis.** [Further notes on the resistance of *Ulmus pumila* to *Ceratostomella ulmi* Buis.] —*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 4, pp. 561–565, 1 fig., 1933. [English summary.]

In continuation of his investigations into the resistance of *Ulmus pumila* in Italy to *Ceratostomella ulmi* [*R.A.M.*, xii, p. 404] the author on 6th June, 1933, inoculated a further lot of 4- and 2-year-old *U. pumila* trees. After 165 days the inoculated trees still appeared to be perfectly normal and their growth was equal to that of the uninoculated controls, though the wood showed distinct traces of the growth of the fungus for a few cm. above and below the inoculation site. The *U. pumila* trees inoculated the previous year [loc. cit.] showed no outward sign of the disease.

In the vicinity of Florence and Bologna *U. pumila* trees and

seedlings growing in the midst of abundant natural infection have remained to all appearances perfectly healthy.

From these observations the author concludes that *U. pumila* is for all practical purposes resistant to *C. ulmi*.

TRUMBOWER (J. A.). **Control of Elm leaf spots in nurseries.**—*Phytopath.*, xxiv, 1, pp. 62–73, 3 figs., 1934.

The fungicides applied three times in 1932 in eight experimental plots of elm nursery stock at the Illinois State Natural History Survey, primarily against wilts [associated with a species of *Coniothyrium* and other fungi: *R.A.M.*, xii, p. 124], were shown to cause a considerable reduction (40 to 90 per cent.) in the incidence of three common leaf spots, *Gnomonia ulmea* [ibid., x, p. 632], *Gloeosporium ulmicolum*, and *G. inconspicuum*. Equally satisfactory results were obtained with 4–4–50 Bordeaux mixture, dry-wettable flotation sulphur spray, flotation sulphur dust, koloform, and kolodust [ibid., xii, pp. 504, 708].

KLEBAHN (H.). **Eine Blattkrankheit der Edelkastanie und einige sie begleitende Pilze.** [A leaf disease of the Chestnut and some fungi accompanying it.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 1, pp. 1–23, 14 figs., 1934.

Chestnut (*Castanea vesca*) trees near Bozen, South Tyrol, bore in October numerous yellow and brown, frequently confluent spots containing pycnidia with *Septoria*-like, mostly triseptate conidia, measuring 33 to 45 by 3 μ. In the following spring the affected leaves developed nearly spherical perithecia of a *Mycosphaerella*, 70 to 80 μ in diameter, together with other fungi. The perithecia contained asci 43 by 6 μ in diameter, and the hyaline, uniseptate, elongated, or fusiform ascospores, measuring 12 to 13 by 3 to 4 μ, gave cultures in which olive-green hyphae and elongated-cylindrical, fairly straight conidia, with three cross walls, measuring 32 to 48 by 2·5 to 3 μ, and agreeing with those of the *Septoria*, developed. Inoculation experiments with pure cultures from the ascospores produced spots which bore pycnidia on a few chestnut seedlings and confirmed the genetic connexion between the *Septoria* and the *Mycosphaerella*. The more or less spherical pycnidia were 70 to 100 μ in diameter, often tapering towards the ostiole, with a plectenchymatous wall not exceeding 12 μ in thickness, and contained relatively few *Septoria* conidia, together with numerous bacillary spores, 2 by 0·3 μ in diameter, which are regarded as microconidia. The conidial stage is considered to agree with *Septoria castanicola* Desm. and the *Mycosphaerella* genetically connected with it is regarded as a new species and named *M. castanicola*.

Taxonomic particulars are further given of various other fungi accompanying *M. castanicola* on the diseased chestnut foliage, including *Lophiotrema* (*Lophiosphaera*) *castaneae* n.sp., *Venturia* (?) *castaneae* n. sp., and *Chalcosphaeria pustula* (Pers.) v. Höhnel (*Hypospila pustula* [Pers.] Karsten) forma (?) *castaneae*.

CIFERRI (R.). **La 'rosetta' del Frassino coltivato nei pescheti rosettati.** [Rosette disease of Ash grown in affected Peach groves.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 4, pp. 554–560, 2 pl., 2 figs., 1 plan, 1933. [English summary.]

A description is given of the symptoms of nutritional rosette disease as observed on cultivated ash (*Fraxinus ornus*) growing in close proximity to peaches affected with the same disease [see above, p. 384]. The symptoms on ash closely resembled those on peach, except that on the former the disease progressed more slowly and the leaves remained a pale green. The soil was almost neutral (P_H 7·4 to 7·5) and poor in lime.

DAY (W. R.) & PEACE (T. R.). **Poplar canker.**—*Quart. Journ. of Forestry*, xxviii, 1, pp. 32–43, 2 figs., 1934.

Poplar canker [*R.A.M.*, xii, p. 127], attributed in various countries to at least 12 different fungi and bacteria, is quite common in England, where many of the cankers show no trace of fungal fructification. The bacterial type of injury, usually found on *Populus eugenii* Simon-Louis and *P. candicans* Aiton, is apparently the more serious form, but in every case the authors' isolations have yielded a number of different organisms, including species of *Micrococcus* and *Bacillus*.

On the more resistant poplars small cankers are usually confined to the twigs and small branches, to which they impart a knobby appearance. On more susceptible trees the size of the cankers largely depends on the age of the limb, and girdling may occur. Bacterial canker development begins in spring, continues into the summer, and may affect a part previously uninjured. The leaf node below a bud, or the bark where a side branch joins a large one, may crack, the crack extending downwards much more than upwards, and giving out a bacterial exudation. Two or three weeks later, microscopic examination shows large rents in the medulla and usually in the bud or shoot trace round which the injury occurred. Bacterial cavities are present in the cortex, phloem, cambium, xylem, and medulla, though the rents in the leaf or branch traces are generally free from them. Hyphae of undetermined species of fungi are always present in the dead outer bark. Many of these features are, however, typical of frost injury, and the cause of the disease remains obscure.

Owing to the prevalent confusion in the nomenclature, much uncertainty exists as to varietal susceptibility to canker. *P. canadensis* is frequently reported as cankered, but this name is used for most of the black Italian hybrids. The most susceptible species in England are *P. eugenii* and *P. candicans*, but *P. trichocarpa* Torr. and *P. generosa* Henry are also liable to be severely affected. Among the Lombardy poplars, *P. alba* var. *pyramidalis* Bunge, the fastigiate variety of white poplar, appears to be the most injured. Important, apparently resistant, species are *P. marylandica* Bosc., *P. angulata* Aiton, *P. robusta* Schneid. and *P. serotina* Hartig, all of the black Italian group; on the two last named small cankers occur on the twigs, but no damage ensues.

A bibliography of 10 titles is appended.

IYENGAR (A. V. V.). **Contributions to the study of the spike-disease of Sandal (Santalum album, Linn.). Part XV. The role of plant acids in health and disease.**—*Journ. Indian Inst. Sci.*, xvi, A, 13, pp. 139–152, 2 figs., 1 graph, 1933.

A comparative examination [by methods which are described] of the chemical composition of healthy and spike-diseased sandal (*Santalum album*) leaves [*R.A.M.*, xiii, p. 198] from southern India showed that the former contain more malic and much more oxalic acid than the latter; succinic acid, though abundant in spiked leaves, was absent from healthy ones or present only in traces. The disease disturbs the buffering capacity of the tissue fluids in the affected leaf, which contain more phosphates than those of the healthy leaf. Carbon dioxide is more actively produced in spiked than in healthy leaves, but cut shoots (with leaves) from diseased sandal gave off less carbon dioxide per unit weight than did similar healthy material.

MILLER (P. W.). **Fourth report of progress of studies on Walnut blight and its control in Oregon.**—*Twenty-fifth Ann. Rept. Oregon State Hort. Soc.*, pp. 139–152, 1934.

In further commercial spraying tests in Ohio satisfactory control of walnut blight (*Bacterium juglandis*) [*R.A.M.*, xii, pp. 182, 338] in grafted orchards was again given by two applications of Bordeaux mixture (3–3–50) made just before blooming of the pistillate flowers and immediately after, when the stigmas of the pistils were turning brown. In one orchard this treatment gave 8 per cent. infection, as against 41 and 60·9 per cent., respectively, for the trees sprayed once and those left unsprayed. In another test, the crop from trees sprayed three times and from those not sprayed averaged 36 and 18 lb. per tree, respectively. When delayed even for a few days, however, the second application was sometimes practically useless. If heavy rain falls after blooming, while the nuts are susceptible, a third spraying should be effected when they are about half an inch in diameter. The total cost, including labour, of spraying a tree 45 ft. high was 15 to 25 cents for each application, varying mainly according to the amount of foliage on the tree.

In seedling orchards, where variations in the period of flowering and especially the early flowering of some trees makes control much more difficult, moderate success resulted from two pre- and two post-blossom applications, this treatment in one instance giving 7·7 per cent. infection as against 23·2 and 87·2 per cent., respectively, for trees given three applications and those left unsprayed.

Leaf burn was reduced without loss of efficiency by the experimental use of excess lime Bordeaux mixture (3–9–50); ammoniacal copper carbonate (2–50) gave almost as good control as Bordeaux mixture (3–3–50), with relatively little spray injury.

COLE (J. R.). **Liver-spot disease of Pecan foliage caused by Gnomonia caryae pecanae nov. var.**—*Journ. Agric. Res.*, xlvii, 11, pp. 869–881, 7 figs., 1933. [Received April, 1934.]

An account is given of the author's investigation of the *Gnomonia*

leaf spot of pecan (*Hicoria* [*Carya*] *pecan*) recently reported from the southern United States [*R.A.M.*, xi, p. 213] and prevalent in 1931 in central Mississippi, Arkansas, northern Louisiana, and Texas, causing premature defoliation in some areas. The disease is favoured by high temperature and low rainfall, and attacks trees weakened through overcrowding or unfavourable soil conditions, though in the Red River Valley even vigorous trees are affected.

Entry is effected through the leaf stomata, and the first symptom consists in the appearance of umber or dresden-brown ('liver-coloured') spots, which may enlarge up to 1 cm. in diameter or coalesce, on the lower surface of the leaflets. Towards autumn they turn cinnamon-brown and become visible also on the upper surface, at which stage the leaflets usually fall.

The causal organism, the pathogenicity of which was experimentally established, has flask-shaped perithecia usually scattered singly or in groups of two or three surrounded by pycnidia and measuring 300 to 350 μ in breadth and 250 μ high, with beaks 200 to 250 by 50 to 60 μ. The hyaline, eight-spored, cylindrical, thin-walled asci, 45 to 50 by 6 to 8 μ, are furnished with a pore at the apex. The straight or curved, hyaline, 1-septate ascospores, 22 to 28 by 3 to 4 μ, have setae at both ends. The superficial, sub-globose, reddish-brown pycnidia are 75 to 300 μ in diameter, and the continuous, hyaline, curved, fusoid conidia, attenuated towards the apex, are 15 to 20 by 2 to 3·5 μ. The simple, hyaline, 1- to 2-septate conidiophores measure 18 to 25 by 3 to 5 μ.

The fungus shows some morphological differences from *Gnomonia caryae* Wolf on *Hicoria* spp. and is regarded as a distinct var., *pecanae*. Its imperfect stage is considered to be a *Leptothyrium* rather than a *Gloeosporium*, and differs sufficiently from the similar stage of *Gnomonia caryae* (*Gloeosporium* or *Leptothyrium caryae*) to be made a new var., *L. caryae* var. *pecanae*.

In culture the fungus grew best at 24° C. and between P_H 5·8 and 7.

The Schley and Georgia Giant varieties are highly resistant, and Stuart, Van Deman, and Pabst very susceptible.

At Shreveport, Louisiana, excellent control resulted from one application of Bordeaux mixture (4–6–50) at the end of May.

DAVIS (W. H.). **Twig blight (Hypomyces ipomoeae) of the American Bladder Nut.**—Abs. in *Phytopath.*, xxiv, 1, p. 6, 1934.

The tips of dead bladder nut (*Staphylea trifolia*) twigs were found to be spotted with the rose-coloured spore masses of *Hypomyces ipomoeae* [*R.A.M.*, ix, p. 376], apparently not hitherto recorded on this host. The blight first appears in mid-July and may destroy 50 per cent. of the root sprouts or girdle the main stem. Inoculation experiments gave positive results only on the buds and in the meristem. Perithecia were formed in the dead bark during late October and the ascospores germinated best in the following May. The mycelium can also overwinter in the stem.

YOSHII (H.). **Studies on Gloeosporium kawakamii Miyabe. IV. On the anthracnose of Paulownia tomentosa caused by Gloeosporium kawakamii Miyabe.**—*Bull. Sci. Fakultato Terkultura, Kjušu Imper. Univ.*, v, 5, pp. 523–545, 11 figs., 1933. [Japanese, with English summary.]

Paulownia tomentosa is stated to be widely attacked in Japan by a leaf and stem anthracnose due to *Gloeosporium kawakamii* [*R.A.M.*, xii, p. 375], the infection hyphae produced by the appressoria of which traverse the cuticle of the host and may occupy the epidermal cells within 24 hours. Necrosis may ensue after three days as a result of widespread infection by the mycelium. Severe injury from *G. kawakamii* is confined to young plants, in which the formation of wound phelloderm is not yet complete. *P. coreana* was found to be resistant to *G. kawakamii*, the hyphae of which succeed in entering the cells but are then repelled apparently by a combination of mechanical strength and anti-toxic secretions in the host tissue.

DEARNESS (J.) & HANSBROUGH (J. R.). **Cytospora infection following fire injury in western British Columbia.**—*Canadian Journ. of Res.*, x, 1, pp. 125–128, 1934.

In 1931, following a light ground fire near D'Arcy, British Columbia, a species of *Cytospora*, which appeared but was not definitely proved to be genetically connected with *Valsella pulcherrima*, was found on *Salix* sp., *Populus trichocarpa* [var.] *hastata*, *Betula fontinalis*, *Alnus tenuifolia*, *Cornus occidentalis* [*C. pubescens*], *Amelanchier florida* [*A. alnifolia*], *Crataegus brevispina*, *Rosa nutkana*, *Philadelphus gordonianus*, *Acer glabrum* [var.] *douglasii*, and *Sambucus glauca*. The fungus is provisionally named *C. pulcherrima* [with an English diagnosis] and is characterized by sparsely distributed, conical pustules, dark grey, erumpent cortical stromata, 1 to 1·3 mm. in diameter at the base, and allantoid, hyaline conidia, 3·5 to 4 by 0·75 μ, borne on filiform, fasciculate, or subdendriform conidiophores and issuing from the minute, black ostiole of the pycnidial chambers either as pale amber-coloured, hair-like tendrils or as darker corkscrews, horns, or beads. Douglas firs (*Pseudotsuga taxifolia*) in the affected area bore *C. friesii*, while an unidentified species with conidia measuring 6 to 8 by 2 μ and darker, coarser cirrhi than *C. pulcherrima* occurred on *Grossularia divaricata*, *Ribes sanguineum*, and *Rubus leucodermis*.

CHRISTOFF (A.). „Сѣченето" на иглолистния разсадъ и срѣдствата за борба съ него. ['Damping-off' of Coniferous seedlings and its control.]—Reprinted from *Горски Прегледъ* [*Forestry Review*], Sofia, xix, 9–12, 55 pp., 1933. [English summary.]

Damping-off of coniferous seedlings, chiefly caused by *Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani*, but also associated with numerous species of *Fusarium*, is stated to be very prevalent and destructive in the Bulgarian State forests near Sofia, where the losses accruing from it frequently range from 80 to 100 per cent. of the seedlings. After a brief description of the

symptoms, the author gives a detailed account of controlled experiments with a wide range of soil disinfectants, the results of which showed that most of the preparations used abroad, e.g., formalin, sulphuric acid, copper sulphate, and the like, are either too expensive or unsuitable for local conditions. Excellent results were obtained with a 0·001 per cent. solution of boric acid at the rate of 10 litres per sq. m., this being stated to be by far the cheapest disinfectant tried. Equally good results were obtained with a 1 to 1·2 per cent. acetic acid solution applied 7 to 10 days before sowing, or 0·1 to 0·2 per cent. applied immediately after sowing. It is pointed out that the efficacy of these two substances depends in a very large measure on the reaction of the soil; where the latter is highly alkaline, preference should be given to 0·2 per cent. mercuric chloride which was also shown to be very effective, but the general use of which is deprecated because of its relative high cost and toxicity to man.

FAULL (J. H.). **The biology of Milesian rusts.**—*Journ. Arnold Arboretum*, xv, 1, pp. 50–85, 3 pl., 1934.

Species of *Milesia* (*Milesina*) are known to occur on 16 genera of Polypodiaceae and 11 species of *Abies*. The present paper records the writer's studies, conducted from 1924–7 in Ontario, Canada, and in 1933 at Harvard University, on the life-histories of *M. fructuosa*, *M. intermedia*, *M. marginalis*, and *M. polypodophila* [cf. *R.A.M.*, xi, p. 340]. The diploid stage (on the ferns) has been found somewhat narrowly restricted in host range, but the haploid, so far as is known confined to the genus *Abies*, is more polyphagous, *M. fructuosa* having been successfully inoculated by the writer on *A. amabilis*, *A. balsamea*, *A. cephalonica*, *A. concolor*, *A. fraseri* and its [var.] *prostrata*, *A. magnifica*, and *A. nephrolepis*. Teleutospores of *M. fructuosa* formed in the autumn required a resting period before germination could be induced at the onset of winter. Both this species and *M. polypodophila* are of some economic importance in hampering the natural reproduction of *Abies*, the former primarily threatening the development of *A. magnifica* and the latter that of *A. balsamea*.

HIRATSUKA (N.). **On some new species of Milesina.**—*Bot. Mag.*, Tokyo, xlviii, 565, pp. 39–47, 6 figs., 1934.

Technical descriptions, supplemented by Latin diagnoses, are given of seven new species of *Milesina* [*Milesia*: see preceding abstract] found on various species of ferns in Japan.

FAULL (J. H.). **A remarkable Spruce rust, Peridermium parksianum, n.sp.**—*Journ. Arnold Arboretum*, xv, 1, pp. 86–87, 1934.

A brief description, supplemented by a Latin diagnosis, is given of *Peridermium parksianum* n.sp., recently observed in California and Oregon attacking the current season's needles of *Picea sitchensis*. The broad-based spermogonia, triangular in vertical section, suggest that the diploid stage of the rust is probably a *Melampsoropsis*.

SIBILIA (C.). **La malattia della defogliazione della 'Pseudotsuga' da 'Rhabdocline pseudotsugae' Syd.** [Needle fall of *Pseudotsuga* caused by *Rhabdocline pseudotsugae* Syd.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, pp. 591–600, 1933.

In this paper, based partly on Van Vloten's recent monograph [*R.A.M.*, xii, p. 63], the author gives a succinct account in semi-popular terms of the information at present available on needle fall (*Rhabdocline pseudotsugae*) of Douglas fir (*Pseudotsuga*) [*taxifolia*]. The chief points dealt with include the symptoms of the disease, mode of infection and spread, life-history of the causal organism, and varietal reaction to attack [ibid., v, pp. 637, 638; xii, pp. 64, 65]. To prohibit the importation of *Abies*, *Pinus*, and *Picea*, as was recently done in Italy [ibid., xii, p. 528], where, in any case, *Pseudotsuga* is only of very minor importance, appears to be a measure of excessive prudence, the fungus being a strictly obligate parasite [ibid., xii, p. 64] and the allegation that it attacks *Abies* unfounded [ibid., x, p. 571].

HUMPHREY (C. J.) & SIGGERS (P. V.). **Temperature relations of wood-destroying fungi.**—*Journ. Agric. Res.*, xlvii, 12, pp. 997–1008, 1 fig., 64 graphs, 1933.

This is a brief account of the results [presented in the form of graphs] of the authors' studies of the temperature relations in pure culture on malt extract agars under controlled conditions of 64 species and strains [an alphabetical list of which is given] of wood-destroying fungi, most of which are common in the United States and Cuba, while several are cosmopolitan. Of this number, 12 were found to have optimum temperatures of 24° C. or below, 42 between 24° and 32°, and 10 above 32°. The maximum temperatures for growth were determined for all but two of the cultures used in the tests, with the result that 62 stopped growth at 46° C. or below, 46 at 40° or below, and 24 cultures at 34° or below. The growth of about 85 per cent. of the species and strains was prevented within a range of 12° above the optimum but there was no definite relationship between the optimum, and the maximum temperature totally inhibiting growth, the latter being apparently specific to the organism concerned. With one exception, all species showing a difference of 6° or less between the optimum and maximum temperatures had their optimum at 32° or below. Many of the organisms showed a rapid growth over a considerable range of temperatures around the optimum, and these tolerated a high maximum temperature, 12° to 16° above the optimum. A downward shifting of the optimum temperatures for growth [cf. *R.A.M.*, ii, p. 565] for successive 7-day observation periods was noted in the case of certain of the cultures studied, suggesting that the optimum temperatures for certain wood-destroying fungi under controlled conditions are higher than the optima for the same rots in nature carried over long periods.

ANDERS (G.). **Warum Hausschwammbekämpfung?** [Why combat dry rot?]—*Ratschläge für Haus, Garten, Feld*, viii, 11, pp. 181–184, 6 figs., 1933. [Received March, 1934.]

In 1929 the writer investigated a particularly severe attack of

dry rot [*Merulius lacrymans*] in an unoccupied room, the fungus advancing at the rate of 1 cm. daily. Its further progress was completely barred by treatment with antinonnin [*R.A.M.*, xi, p. 84], the application of which at a strength of 3 per cent. to walls, joists, and other parts liable to infection is accordingly recommended. The preparation should also be used at the same concentration instead of water for mixing the cement mortar in constructions liable to dry rot.

KORFF (G.) & BÖNING (K.). **Krankheiten und Schädlinge im Gemüsebau in Bayern im Jahre 1933.** [Vegetable diseases and pests in Bavaria in the year 1933.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 9–10, pp. 240–243, 1933–4.

Notes are given on the prevalence and distribution in relation to meteorological conditions of some well-known diseases and pests of vegetables occurring in Bavaria in 1933.

WALKER (J. C.). **Diseases of Cabbage and related plants.**—*U.S. Dept. of Agric. Farmers' Bull.* 1439, 28 pp., 14 figs., 1934.

Popular notes (superseding those contained in the former bulletins on the same subject, 925 and 1351) [*R.A.M.*, vi, p. 590] are given on the symptoms, etiology, distribution, and control of a number of fungous, bacterial, and physiological diseases of cabbage and related crops in the United States.

WOODMAN (R. M.), BRENCHLEY (G. H.), & HANLEY (F.). **Soil treatment for Brassicae. I. The effect of sterilisation of the soil by mercuric chloride on the seedling growth of Brussels Sprouts.**—*Journ. Soc. Chem. Ind.*, liii, 4, pp. 35T–36T, 1934.

Significant reductions in the dry weights of the tops, roots, and total seedlings of Cambridgeshire Champion Brussels sprouts followed the sterilization of the seed-beds at the Cambridge Horticultural Research Station with 0·05 to 0·2 per cent. solutions of mercuric chloride against *Plasmodiophora brassicae* [*R.A.M.*, xii, p. 412]. Low concentrations of the disinfectant were found to affect the roots much more seriously than the tops, so that the top to root ratio is significantly greater than the equivalent for normal seedlings in untreated clean soil, the root thus maintaining a relatively larger top. With stronger solutions the root system is still more severely damaged but the effect on the tops is then so marked that the ratio does not differ appreciably from that of the untreated controls, a normally proportioned but smaller seedling being obtained.

OSBORN (T. B.). **Incubation period of Pea mosaic in Macrosiphum pisi.**—Abs. in *Phytopath.*, xxiv, 1, p. 15, 1934.

The pea aphid, *Macrosiphum pisi*, has been used as a vector in the transmission of pea mosaic to broad beans [*Vicia faba*], garden peas, sweet peas, and Canada field peas, the first named being used in the majority of the trials [*R.A.M.*, xii, pp. 414, 741]. After feeding on diseased pea plants the aphid acquired the capacity (retained throughout the active feeding life) to transmit infection. The

incubation period of the pea mosaic virus within the insect was found to range from 12 to 28 hours.

SNYDER (W. C.). **Pod deformation of mosaic-infected Peas.**—*Phytopath.*, xxiv, 1, pp. 78–80, 1 fig., 1934.

In California the pea mosaic [see preceding abstract] virus causes marked distortion of the pods. The ovary wall becomes corrugated and in severe cases the almost unrecognizable stunted and distorted pod produces no seed. The foliage symptoms of the disease correspond in the main with those described from Wisconsin by Doolittle and F. R. Jones [*R.A.M.*, v, p. 337], ranging from simple mottling to extreme twisting, dwarfing, curling, or even rosetting, sometimes extending to the petioles, tendrils, and stems. The loss from pod distortion may amount to 10 per cent. or more of the crop.

VESTAL (E. F.). **Pathogenicity, host response and control of Cercospora leaf-spot of Sugar Beets.**—*Iowa Agric. Exper. Stat. Res. Bull.* 168, pp. 43–72, 10 figs., 1933.

In pure culture on artificial media conidia of *Cercospora beticola* from an infected leaf of sugar beet in Iowa began to appear in 12 to 20 hours after isolation or transfer, optimum production taking place 48 to 96 hours after transfer. Germination took place at any point, but usually near a septum and from the basal end of the cell first. On the living leaf the conidia did not germinate in atmospheres of under 90 per cent. humidity, though at 96 per cent. all germinated. An air humidity of 75 per cent. was necessary before conidial formation could take place, and increasing humidity from 75 to 96 per cent. produced an increase in conidial length from 100·4 to 185·2 μ. The leaf is entered through the stomata but many germ-tubes passed over stomata without entering. Penetration was unaffected by changes in atmospheric humidity. Seedlings were more readily infected than mature plants.

Twenty-six species of plants belonging to twelve widely separated families were successfully infected in the greenhouse by spraying with conidial suspensions of *C. beticola*. In the field six species of plants in six widely separated families were found to be infected with a *Cercospora* morphologically and pathogenically similar to *C. beticola*, and evidence was also obtained that the beet leaf spot fungus may live saprophytically in the field on leaves other than those of sugar-beet.

Planting in rows 20 in. apart gave a greater yield of beets than did planting in rows either 12 or 24 in. apart, and retarded the spread of infection by about 10 days as compared with the 12 in. spacing, resulting in a reduction in the number of dead leaves by 16 per cent.

The use of machinery, by rendering cultivation more rapid and uniform than with manual labour, gave much more effective control of weeds and maintained a lower humidity among the beet leaves, thus assisting control of the leaf spot.

A bibliography of 50 titles is appended.

DOOLITTLE (S. P.) & WELLMAN (F. L.). **Commelina nudiflora, a monocotyledonous host of a Celery mosaic in Florida.**—*Phytopath.*, xxiv, 1, pp. 48–61, 3 figs., 1934.

An expanded account is given of the writers' studies on the part played by *Commelina nudiflora* in the spread of celery mosaic by *Aphis gossypii* in Florida [*R.A.M.*, xii, p. 136]. In one instance the virus was also found infecting *Physalis lagascae* [*P. minima*].

BÖNING-SEUBERT (E.). **Die Mosaikkrankheit der Gurken.** [The mosaic disease of Cucumbers.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 9–10, pp. 219–221, 1933–4.

A semi-popular account, based mainly on American investigations, is given of the symptoms, etiology, transmission, and control of the mosaic disease of cucumbers, which is stated to be responsible for heavy damage in German glasshouses, without having so far aroused much attention.

Legislative and administrative measures.—*Internat. Bull. of Plant. Protect.*, viii, 1, pp. 11–15, 1934.

GERMANY. Paragraph 8 of the new edition (24th October, 1933) of the Convention for the commerce in potatoes in Germany established at Berlin ('Berliner Vereinbarungen') contains regulations governing the commerce in seed potatoes [cf. *R.A.M.*, xii, p. 653]. No notification is required if the percentage of total visible disease is below 0·5, a reduction of price is imposed if the percentage is between 0·5 and 4, and above 4 there is a right of refusal. Slight skin lesions or scab [*Actinomyces scabies*] covering less than 10 per cent. of the surface do not require notification, while over 3 per cent. of wet rot permits of refusal.

ITALY. The regulations embodied in the Royal Decree No. 1700 of 12th October, 1933, provide (*inter alia*) for the formation of a central bureau for plant protection under the Ministry of Agriculture and Forests, which will utilize the following organizations for the services of inspecting, reporting, and treatment of diseased plants: Committee for Plant Protection, Institutions for Research and Scientific Experimentation in Phytopathology, Observatories for Plant Diseases, and Provincial Commissariats for Plant Diseases [cf. ibid., viii, p. 480].

United States Department of Agriculture. Bureau of Plant Quarantine. Rice Quarantine No. 55. Revision of quarantine and regulations.—4 pp., 1933. [Received March, 1934.]

With a view to preventing the introduction into the United States of certain injurious fungous diseases of rice, including downy mildew (*Sclerospora macrocarpa*), leaf smut (*Entyloma oryzae*), blight (*Oospora oryzetorum*), and glume blotch (*Melanomma glumarum*), the present revision, effective 23rd November, 1933, of Quarantine No. 55 [*R.A.M.*, xii, p. 464] prohibits the importation from any foreign country except Mexico of seed or paddy rice, rice straw, or hulls, while seed or paddy rice may only be procured from Mexico under permit.

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NEUWIRTH (F.). **Houba Phoma betae Frank a její význam při chorobách vzcházejici Řepy.** [The fungus *Phoma betae* Frank, and its significance among the diseases of germinating Beets.]—*Ochrana Rostlin*, xiii, 3–4, pp. 115–135, 3 figs., 1933.

As a result of his cultural and other studies of *Phoma betae* [*R.A.M.*, xiii, p. 347], details of which are given, and also from a review of the work of other investigators on the pathogenicity of the fungus to germinating beet, the author concludes that under the climatic and soil conditions in Czecho-Slovakia it plays only a very secondary part in the etiology of the seedling diseases of the sugar beets. It is only able to attack seedlings weakened by other causes, and its control in Czecho-Slovakia may be easily effected by cultural practices tending to increase the vigour of the plants, as well as by the use of healthy certified seed of home production.

BLATTNÝ (C.). **Mosaika na Celeru (Apium graveolens).** [Mosaic of Celery (*Apium graveolens*).]—*Ochrana Rostlin*, xiii, 3–4, pp. 145–146, 1933.

The author reports a heavy outbreak in 1933 of celery mosaic [*R.A.M.*, xii, p. 136], this being stated to be the first record of the disease in Czecho-Slovakia. The spread of infection was correlated with the prevalence on the crop of the insect *Chlorita flavescens*. Field observations seem to indicate that the disease is not transmissible to celeriac, which remained healthy in close proximity to the diseased celery plants. Mosaic did not appear to reduce the susceptibility of affected celery plants to leaf spot (*Septoria apii*).

BÖNING (K.). **Versuche zur Bekämpfung der Septoria-Blattfleckenkrankheit des Selleries mit chemischen Mitteln.** [Experiments in the control of the *Septoria* leaf spot disease of Celery by chemical methods.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 9–10, pp. 231-237, 1933–4.

A tabulated account is given of the writer's experiments in 1933 at the Munich Institute of Agriculture and Plant Protection in the control of celery leaf blight (*Septoria apii*) by spraying and dusting with copper-containing preparations [*R.A.M.*, x, p. 771]. In

the seed-bed the incidence of infection on the Münchner Markt variety was reduced from 84·6 to 7, 7·3, and 2·5 per cent., respectively, by three applications on 8th and 20th May and 6th June of Bordeaux mixture, Wacker's Bordeaux mixture (copper-lime) [ibid., xii, p. 243], and cusisa dust [ibid., xi, pp. 348, 754, 764], the liquid mixtures being used at a strength of 1 per cent. on the first occasion and at 2 per cent. thereafter. Five applications of the same preparations (2 per cent. for the liquids) were given in the field on 8th and 19th July, 4th and 26th August, and 10th September. The best results were given by the Wacker brand of Bordeaux mixture, which resulted in an increased root [celeriac] production of 60 per cent. over the untreated plants, the corresponding figures for cusisa and ordinary Bordeaux being 55 and 41 per cent., respectively. In a further test to ascertain the relative efficacy of one, two, or three treatments with Bordeaux mixture, little difference in the incidence of infection was observed, but in the plots receiving the maximum number the total number of leaves per 100 plants was increased from 1,178 to 1,529 with a corresponding augmentation of 44 per cent. in the yield of roots. Of the seven varieties receiving five treatments with Bordeaux mixture the highest increase (134 per cent. of marketable roots over the unsprayed) was shown by Delikatess, and the lowest (25 per cent.) by Prager Riesen.

GUBA (E. F.) & HOLLAND (E. B.). **Effect of hydrocyanic acid gas on Cucumber plants previously sprayed with copper fungicides.**—*Massachusetts Agric. Exper. Stat. Bull.* 303, 16 pp., 4 pl., 1933.

Much injury is sometimes caused in Massachusetts cucumber greenhouses from the use of copper fungicides followed by fumigation by hydrocyanic acid gas as an insecticide. Experimental results [which are fully discussed and tabulated] showed that no injury resulted from the application of corona copper carbonate [*R.A.M.*, xii, p. 402] containing 18 or 50 per cent. copper, or of commercial basic copper sulphates (26·31, 52·95, or 53·31 per cent. copper), as used against *Erysiphe cichoracearum* and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xi, p. 152; xii, p. 358, *et passim*], followed by fumigation with the gas. These sprays, when diluted, are neutral to litmus. Gas applications caused or aggravated injury to cucumber plants previously sprayed with acid copper fungicides, i.e., normal and basic copper acetates and acid-Bordeaux, and also with neutral Bordeaux (4-10-50) prepared with milk of lime or filtered lime water.

The spray residue from injured foliage yielded water-soluble copper, the amount of which and the extent of damage generally tended to increase in proportion to the alkali content of the fungicide. The toxic salt is presumably calcium cuprocyanide, $CaCu_2(CN)_4 5H_2O$, or a similar soluble copper salt of cyanide.

It is recommended that fumigation should precede the application of the copper sprays or that only commercial basic copper carbonates, basic copper sulphates, or non-staining ammoniacal copper sprays should be used if fumigation is to follow.

STAPP (C.). **Über die bakterielle Ursache einer Blattfleckenkrankheit und Fruchtfäule der Gurken in Deutschland.** [On the bacterial origin of a leaf spot disease and fruit rot of Cucumbers in Germany.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 17–28, pp. 377–386, 7 figs., 1934.

The writer's examination of isolations from cucumber leaves and fruit affected by the angular leaf spot disease in central and south Germany left no doubt as to the substantial agreement of the causal organism with *Bacterium* (*Pseudomonas*) *lacrymans* [*R.A.M.*, xii, p. 92]. Some insignificant physiological differences are shown by the German strain, the dimensions being also slightly divergent, namely, 1·2 to 2·4 by 0·5 to 0·7 μ on bouillon agar, 1 to 1·8 by 0·5 to 0·7 μ on neutral potato agar, and 1·4 to 2·2 by 0·5 to 0·7 μ on carrot agar, compared with 1 to 2 by 0·8 μ in the original description of Smith and Bryan (*Journ. Agric. Res.*, v, p. 465, 1915).

YOSHII (H.). **Pathological studies on Watermelon wilt. II. On the migration of microconidia.**—*Bull. Sci. Fakultato Terkultura, Kjušu Imper. Univ.*, v, 5, pp. 577–589, 5 figs., 1 graph, 1933. [Japanese, with English summary.]

During the period from 27th June to 7th October, 1932, the total longitudinal growth of the mycelium of *Fusarium niveum*, the agent of watermelon wilt [*R.A.M.*, xiii, p. 5], amounted to only 600 mm. on a medium consisting of 100 c.c. onion decoction, 1 gm. of dipotassium hydrogen phosphate, 0·50 gm. magnesium sulphate, 900 c.c. water, and 20 gm. each of dextrose and agar. The growth of corresponding cultures of *Sclerotinia libertiana* [*S. sclerotiorum*] and *Valsa mali* [ibid., iv, p. 612] was considerably more rapid. In the host tissues the development of *F. niveum* is even slower than in culture, so that the presence of the fungus in parts of the plant remote from the point of entry of the mycelium at the root tip is evidently attributable to the migration of the microconidia (which measure 10 by 3 to 3·5 μ) from the mother hyphae along the transpiration stream. The microconidia are readily detachable from the short, simple conidiophores (on which they are produced at the tips or sides of the hyphae) in the vessels, and from 50 to 82 per cent. of them were found to be capable of traversing the tracheae of watermelon stems 6 mm. in diameter.

JOËSSEL (P. H.). **Essais de traitements contre l'oidium ou 'blanc' du Melon, en 1933.** [Experiments with treatments against *Oidium* or powdery mildew of Melon in 1933.]—*Prog. Agric. et Vitic.*, c, 51, pp. 599–603, 1933.

In a test for the control of melon powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xi, p. 94] carried out in 1933 in the vicinity of Avignon, 'Ananas (Melon) brodé d'Avignon' melons were given applications of (1) permanganate of potash 0·125 kg. per 100 l. water, (2) the same and sublimed sulphur, (3) as (2) with alkaline Bordeaux mixture (1 kg. copper sulphate and about 0·7 kg. caseinated lime per 100 l. water), (4) permanganate and Bordeaux mixture, (5) Bordeaux mixture, (6) lime-sulphur 0·5 kg. at 32° B. per 100 l. water, and (7) ditto and Bordeaux mixture. The applications of permanganate and lime-sulphur were made on 12th and

28th August and 15th September, and those of Bordeaux mixture and sulphur on 17th and 30th August and 18th September. 'Boule d'Or' melons were given identical treatments, except that the applications of the 12th and 17th August were omitted. One plot of each variety remained untreated.

When each variety was first treated, the Ananas d'Avignon melons were completely unaffected and the Boule d'Or showed a few spots of mildew. On 22nd August, a few lesions were noted on the untreated Ananas d'Avignon. By 28th August, the untreated melons and those which had received permanganate had become affected, whereas those given lime-sulphur and Bordeaux mixture were still healthy. By 12th September most of the controls were completely dried up, whereas the plots treated with lime-sulphur or Bordeaux mixture showed only slight infection on the under surface of the leaves. The curative effect of the permanganate was only transitory, both varieties after being treated on 28th August being severely attacked on 12th September. The sulphur caused serious scorching on Ananas d'Avignon.

No appreciable differences were observed between the effects of the lime-sulphur and Bordeaux mixture schedule, the Bordeaux mixture and permanganate, the Bordeaux mixture alone, and the lime-sulphur alone. On the whole, the disease caused least damage in the plots treated with Bordeaux mixture, the action of which was mainly to retard infection [ibid., x, p. 702]; the lime-sulphur gave slightly less satisfactory results.

GARCIA (F.). **Reduction of Chile wilt by cultural methods.**—*New Mexico Agric. Exper. Stat. Bull.* 216, 15 pp., 4 figs., 1933. [Received April, 1934.]

In field tests [which are described, and the results of which are tabulated] carried out over a number of years in New Mexico to ascertain the effect of different cultural practices on the incidence of chilli pepper [*Capsicum annuum*] wilt (*Fusarium annuum*) the average amount of infection in the plots (irrigated at two- or three-week intervals) cultivated according to the level, native-ridge, and the new furrow-ridge [*R.A.M.*, xii, p. 748] methods was, respectively, 41·7, 19·2, and 7 per cent. With irrigation at 7-day intervals the level-culture method gave 54·7 per cent. average wilt, as against 21·7 per cent. for the furrow-ridge, the corresponding figures for 14- and 21-day irrigations being, respectively, 33·8 and 7·8 and 21·9 and 5 per cent.

BAKER (J. A.). **Mushroom growing in Province Wellesley & Penang.**—*Malayan Agric. Journ.*, xxii, 1, pp. 25–28, 6 figs., 1934.

The commercial growing of mushrooms was introduced into Malaya by the Chinese in 1932, the species cultivated being *Volvaria volvacea*, which is the principal species cultivated in the Dutch East Indies. Bundles of rice straw are soaked in water for two days and used to cover an earth bed on which a layer of spawn is distributed round the edges. The mass is pressed down, and another layer of spawn laid on it, the process being repeated with a third layer. A kind of thatch is then added, the bed being completed

by spreading a thin layer of haulms over it from side to side. As each layer is made it is copiously watered. Such a bed is about 4 ft. high, requires about 25 galls. of spawn for a bed 16 by 3½ ft., and should be surrounded by a shallow ditch. No water is applied for a week after the spawn has been sown, but subsequently the bed is watered twice a day.

The first mushrooms may be harvested about 25 days after sowing, and the beds are broken up after about three months when the whole mass of straw is permeated by the mycelium, which provides spawn for the new beds. A bed of the size mentioned yields enough spawn for ten new ones. Under favourable conditions of moisture a bed of this size yields 1⅓ to 2⅔ lb. of mushrooms daily. The mushrooms are marketed either in the fresh or dried condition and are consumed chiefly by the Chinese, the Malays ordinarily eating only the wild species. *V. volvacea* closely resembles the European mushroom [*Psalliota arvensis* and *P. campestris*] in flavour.

Mushroom cultivation would probably form a profitable subsidiary industry to rice growing; the only materials required are straw, water, and spawn, the work is not laborious, and there is a ready market for the produce.

BLATTNÝ (C.). **Jde u mosaiky Révy Vinné o jediný virus?** [Is only one virus involved in Vine mosaic?]—*Ochrana Rostlin*, xiii, 3–4, pp. 104–115, 5 figs., 1933. [German summary.]

This is a brief account of continued grafting experiments from 1931 to 1933 to study the nature of the Central European vine mosaic as it occurs in Czecho-Slovakia [*R.A.M.*, xi, p. 280; xii, p. 419], the results of which [presented in tabular form] showed that the disease is graft-transmissible to healthy varieties of the European *Vitis vinifera* (among which Portuguese Blue is particularly susceptible) but not to American varieties. Some of the European varieties, e.g., White Riesling, may carry the mosaic in a latent form. 'Roncet' [ibid., xi, p. 280] was seldom transmitted by grafting to American vines; when transmitted to mosaic Portuguese Blue stocks, it caused the development on the latter of a new set of symptoms, in the form of a gradual necrosis of the leaves, starting from the margins. This condition was transmitted to healthy Portuguese Blue stocks, in which it caused the same symptoms, but only of a transient nature and eventually disappearing. When returned to 'roncet' diseased stocks, this condition caused a temporary inhibition of growth, and defoliation. These results are interpreted to indicate that the Czecho-Slovakian vine mosaic very probably consists of two virus entities, one of which is able to exist independently for a short time; it is believed that this entity is narrowly specialized to a few of the European varieties, and that in nature it contributes in a marked degree to the death of the diseased stocks.

VIELWERTH (V.). **Mosaika Americké Révy vinné.** [Mosaic of the American Vine.]—*Ochrana Rostlin*, xiii, 3–4, pp. 83–90, 1933. [German summary.]

The author states that an assortment of 17 American stock-vine

varieties [a list of which is given], which were planted in 1924 in an experimental field at Bratislava [Czecho-Slovakia] to replace another lot of American varieties exhibiting signs of degeneration, then ascribed to old age, grew normally until 1930, when they suddenly developed pathological symptoms resembling in an intensified form those of the former vines. The disease, which was shown to be transmissible by grafting to two varieties of the European *Vitis vinifera* (Malinger and Italian Riesling), is characterized by a general chlorosis of the foliage, with local mosaic-like patterns, yellow mottling, or red pigmentation of certain areas of the leaf blade, which dry up and drop out. Another symptom is a more or less severe deformation of the leaves, which are crimped between the main veins. Many of the affected stocks show very poor growth. Some of the varieties or individual vines exhibit all the symptoms described in one and the same plant. There was clear-cut evidence of varietal variations in susceptibility to the disease. The experimental plot is strictly quarantined, and is preserved for further systematic studies of the trouble.

VIALA (P.) & MARSAIS (P.). **Sur le court-noué, maladie parasitaire de la Vigne.** [Court-noué, a parasitic disease of the Vine.]—*Comptes rendus Acad. des Sciences*, cxcviii, 1, pp. 26–29, 1934.

A parasitic fungus is stated by the writers to be responsible for the majority of cases of court-noué of the vine in France [*R.A.M.*, viii, p. 421; x, p. 433]. This disease is characterized by various symptoms of progressive degeneration, including stunting of the stock, excessive production of secondary shoots, and curtailment of the internodes (the nodes sometimes being almost imbricated); the leaves are small and laciniate, and the flowers suppressed. The climax of the disease may not be reached for ten years or so, but from the second or third year after infection the yield begins to fall off. Disorders similar to court-noué are known in Burgundy and Aude, respectively, as 'roncet' and 'vigne persillée' or 'jauberdat', in Italy as 'mal nero', in Portugal as 'marromba', and in Germany as 'reisigkrankheit' [ibid., xiii, p. 213].

The most characteristic lesions of court-noué, which the writers have observed in all the French, Algerian, and foreign viticultural regions visited by them, are situated in the pith of the stem whence the fungus, entering through pruning wounds, passes to the xylem and phloem. The blackened tissues are occupied by a dark brown to black mycelium with paler or colourless extensions. In culture the mycelium is snow-white at first, darkening with age, and is composed of septate hyphae, 0·5 to 5 μ in diameter. No true conidia were formed on these hyphae either in nature or in culture but the fungus can apparently be propagated by budding cells and large oidia of variable shape. Intensely black and hard, spherical pycnidia, up to 90 μ in diameter, frequently aggregated in groups of 2 to 12, were obtained in pure culture and contained hyaline, navicular, thick-walled pycnospores, 1·5 by 0·5 μ, tapering at both ends, which in turn produced the above-mentioned mycelial elements. The fungus is referred to the Sphaerioideae, occupying

a position close to *Piptostomum*. It is considered to be new and is named *Pumilus medullae*.

The addition of arsenical compounds to the nutrient media at the rate of 1 part per mille completely prevented the development of *P. medullae*, but the treatment of pruned stems with arsenical solutions is likely to present great difficulties owing to the rapidity of invasion following the first wounds.

[This paper also appears in *Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 46–50, 1934; *Rev. de Vitic.*, lxxx, 2063, pp. 21–23, 1934; and *Prog. Agric. et Vitic.*, ci, 4, pp. 77–82, 1934.]

BRANAS (J.) & DULAC (J.). **Le traitement du mildiou de la Vigne par les bouillies cupriques.** [The treatment of Vine mildew by copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 33–39, 1934.

In this note (to which P. Viala contributes a foreword) the writers seek to establish the basis of efficacy of Bordeaux mixture in the control of downy mildew of the vine (*Plasmopara viticola*) in France [*R.A.M.*, xiii, pp. 148, 149, 214, 314]. Their researches indicate that the partial or total failure of the mixtures in such epidemics as those of 1910, 1915, 1930, and 1932, when the yield was reduced by 20 to 60 per cent., are due to the insufficiency of their copper content. To be effective the solutions formed on the plant should have a copper content exceeding 1 in 100,000.

[This paper is reprinted in *Prog. Agric. et Vitic.*, ci, 5, pp. 107–109, 1934, and with the earlier ones in the same series, in *Ann. École Nat. d'Agric. de Montpellier*, xxiii, 1, pp. 44–56, 1934.]

RIBÉREAU-GAYON (J.). **Sur le traitement du mildiou de la Vigne par les bouillies cupriques.** [On the treatment of Vine mildew by copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 5, pp. 184–189, 1934.

The factors governing the toxicity of copper compounds to *Plasmopara viticola* have not, in the writer's opinion, been correctly interpreted by Branas and Dulac [see preceding abstract]. As already pointed out in an earlier paper [*R.A.M.*, xii, p. 674], the fungicidal action of a solution depends less on its strength than on the maintenance of the concentration at a given level—a condition realized when a zoospore comes into contact with a particle of copper, which dissolves *pari passu* with the process of fixation of the copper ions by the spore.

MANZONI (L.). **Rilievi anatomici su Viti colpite dal fulmine.** [Anatomical notes on Vines struck by lightning.]—Reprinted from *Annuario Staz. Sper. di Vitic. e di Enol. di Conegliano, 1934*, iv, 2, 22 pp., 7 pl., 1934.

An account is given of an anatomical examination made in April, 1933 of the current year's branches, three-year-old wood, and roots of young wild vines (Teleki 8) planted for stock purposes in the spring of 1931 and struck by lightning, presumably along the wires on which they were trained, in July, 1932. The injuries and disturbances produced, which resulted in the rapid death of the upper parts, while the base remained alive and renewed growth

later on, are fully described and figured, the immediate and more remote effects being enumerated in a summary. It was not until an attempt was made to use the vines for stocks in grafting in the spring of 1933, that the tissue injuries, which rendered grafting impossible, were fully revealed. A bibliography of 12 titles is appended.

MONTEMARTINI (L.). **I parassiti e le malattie delle piante coltivate nella Sicilia occidentale durante il biennio 1932–33.** [Parasites and diseases of cultivated plants in Western Sicily during 1932–33.]—*Riv. Pat. Veg.*, xxiv, pp. 11–36, 1 fig., 1934.

This report on plant diseases in the vicinity of Palermo [cf. *R.A.M.*, xi, p. 495] includes the following items of interest. The most prevalent wheat rust is *Puccinia triticina*, which attacks all the varieties commonly grown, Rossello and Bidi only slightly and Majorca and Mentana very severely. The aecidial stage has not been found locally. Favoured by rain during April and May, 1932, foot rot of wheat associated with *Fusarium culmorum*, *Ophiobolus graminis*, and an undetermined fungus was widespread. The disease of mandarins [*Citrus nobilis* var. *deliciosa*] ('mal dalla terra') caused by *Bacterium citri deliciosae* and characterized by irregular, sharply delimited, depressed, brick-red spots on the skin, which wrinkles and withers, is sometimes severe locally; it is quite distinct from melanosis ('mal di terra') in Catania which is due to *Cytosporina citriperda* [ibid., xii, p. 758]. The leaves and fruit of all varieties of plum in one orchard were attacked by *Bacterium pruni*, while loquats (*Eriobotrya japonica*) were severely affected by *Bacillus amylovorus* [ibid., xi, p. 117]. Custard apples [*Anona* sp.] were injured by a root rot due to *Rosellinia necatrix*. A dry spotting of walnut leaves appeared to be due to *Labrella* [*Leptothyrium*] *coryli*. Pistachio [*Pistacia vera*] leaves bearing profuse, whitish spots with a dark border showed the presence of a *Septoria* differing from *S. pistaciae*.

PEROTTI (R.). **Note fitopatologiche per gli anni 1931–33.** [Phytopathological notes for the years 1931–33.]—*Boll. R. Ist. Sup. Agr. di Pisa*, ix, pp. 439–457, 1 graph, 1933. [Received May, 1934.]

Notes are given on the fungous and bacterial diseases and insect pests attacking cereals, vegetables, fruit trees, olives, vines, and ornamentals during 1931–3 in the districts of Italy under the supervision of the Pisa Agricultural Institute.

Augalų apsaugos stoties 1933 metų darbų apyskaita. [Report of the activities in 1933 of the Plant Protection Station.]—Pamphlet issued by Žemės Ūkio Rūmų Leidinys, Kaunas [Kovno], 47 pp., 10 figs., 1934. [German summary on pp. 30–33.]

In the mycological section of this report [pp. 4–33], V. Vilkaitis states that following the intensification of sugar beet growing in Lithuania in recent years, this crop is increasingly suffering from heart rot [*R.A.M.*, xiii, p. 72]. Experiments in 1933 showed that

in a severely affected field, the incidence of the disease was reduced from 51·7 per cent. to 4·4 per cent. by the application to the soil of 5 kg. borax (in water solution) per hect., while applications of 10 and 20 kg. reduced it to 1·2 and 0·5 per cent., respectively. The addition of about 8 gm. borax to 1 kg. sugar beet seed somewhat improved the stands but did not control the disease. One application of 2 per cent. Bordeaux mixture reduced the percentage of sugar beet plants severely affected with leaf spot (*Cercospora beticola*) [ibid., xiii, p. 211] from 53·95 in the controls to 4·61, and increased the percentage of slightly spotted plants from 17·17 to 73·37, but indicated that one spraying is not sufficient to control the disease.

Details are given of experiments in soil artificially infected with wheat bunt spores (*Tilletia tritici*) [*T. caries*], the results of which showed that the amount of ceresan dust adhering to seed-grain treated with this preparation is not sufficient to control the development of the disease in heavily infected soils.

POLE EVANS (I. B.). **Safeguarding the soil products of the Union. Annual Report of the Division of Plant Industry.**—*Farming in South Africa*, viii, 93, pp. 486–493, 1933.

This report contains, in addition to various items already noticed from other sources, the following information of phytopathological interest. Notes are given on storage and transport diseases of exported plums, peaches, and grapes. Oranges treated by the bleaching method for the removal of sooty blotch (*Gloeodes pomigena*) [see below, p. 437] have been exported and proved commercially satisfactory. No fresh outbreaks of citrus canker [*Pseudomonas citri*: *R.A.M.*, viii, p. 775] were detected among the 125,871 orchard and 26,640 nursery trees examined during 1933. Scaly bark [psorosis: ibid., x, p. 97] was found on 223 of the 393,771 trees inspected in the northern Transvaal and on 3 out of 13,000 in the Cape Province.

In forest plantations in the northern Transvaal *Armillaria mellea* [ibid., xii, p. 142] was found to be spreading rapidly, attacking young *Pinus longifolia* trees and five- to six-year-old *P. patula* and *P. caribaea*. Extension was found to occur exclusively by direct root contact, no rhizomorphs being formed under local conditions. The sources of infection for the pines were the indigenous *Parinarium mobola* and stumps of *Eugenia gerrardi* and *Luchnopylis* [*Nuxia*] sp. The yellowing and death of *Pinus longifolia* in the same district is probably but not certainly due to *Helicobasidium compactum* [ibid., ix, pp. 9, 425].

VAN DER BYL (P. A.). **Agricultural education, extension and research work in the winter rainfall area. Report of the Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch.**—*Farming in South Africa*, viii, 93, pp. 515–517, 1933.

The following are among the items of phytopathological interest occurring in this report. Pear trees suffered extensive injury from

bacterial blossom disease [*Bacterium nectarophilum*: *R.A.M.*, xi, p. 18] in several districts; control measures are being tested and various aspects of the disorder studied. *Sclerotinia sclerotiorum*, the causal organism of green rotting in apricots [ibid., xi, p. 157], was responsible for considerable losses and also induced a die-back of the twigs.

Sulphur dioxide fumigation [ibid., xii, p. 46] was found to be very effective against *Botrytis* rot of grapes for export but less so in the case of *Penicillium* and *Aspergillus*. The colour and flavour of the fruit were impaired by unduly strong concentrations of the gas or protracted treatment. Fumigation should preferably be done before the bunches are packed and wrapped.

The dying-out of fir trees in the George area was found to be primarily due to unfavourable growth conditions, the effect of *Diplodia pinea* [ibid., viii, p. 535] being purely secondary.

KOSTOFF (D.). **Tumor problem in the light of researches on plant tumors and galls and its relation to the problem of mutation (a critical review from biophysical, biochemical and cytogenetical point of view.)**—*Protoplasma*, xx, 3, pp. 440–456, 1933.

A comprehensive summary and discussion are given of recent and contemporary researches on the problem of plant tumours and galls (especially those caused by *Bacterium tumefaciens*) [*R.A.M.*, xiii, p. 16] in relation to human and animal cancer, considered under various aspects. The bibliography comprises 37 titles.

ARTEMOFF (P. K.). К вопросу о поражаемости сортов зерновых культур грибными болезнями. [On the question of varietal susceptibility of cereals to fungal diseases.]—*Bull. Appl. Bot. Genetics, and Plant Breeding*, Leningrad, Ser. A (*Plant Industry in U.S.S.R.*), 7, pp. 75–90, 7 figs., 1933.

To illustrate the very considerable economic losses caused by fungal diseases to cereal crops in Russia, the author states that the shortage in winter and spring wheats due to rusts [*Puccinia* spp.] in 1932 is officially estimated to have been about 51 million cwt., and that in rye, wheat, oats, barley, and millet [*Panicum miliaceum*] due to various smuts to have totalled nearly 18·5 million cwt. These figures show that the cereal rusts are by far the more important diseases, and since 1925 a very large number of home-grown and imported varieties and pure lines of wheats have been officially tested throughout Russia for their resistance to the rusts, and also to the smuts. The results [shown in the form of tables] indicate that the home-produced selections and pure lines are inferior both in yield and in disease resistance to the American importations, among which Kanred × Fulcaster 266287, 266313, 266319, and 266324, Illini Chief × Marquis 242216, Fulhard, and Kawvale exhibited a high resistance to brown rust [*P. triticina*] in 1932, when the disease occurred in epidemic form, together with high resistance to bunt [*Tilletia caries* and *T. foetens*] and loose smut [*Ustilago tritici*], and high yield. There is good evidence that the

productivity and disease resistance of local wheats may be improved by crossing them with the American ones.

AUSEMUS (E. R.). **Correlated inheritance of reaction to diseases and of certain botanical characters in triangular Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 1, pp. 31–57, 5 figs., 1934.

A tabulated account is given of the author's studies, started in 1928 [*R.A.M.*, vii, p. 433], of the genetics of inheritance of reaction to stem [black] rust (*Puccinia graminis*), bunt (*Tilletia tritici*) [*T. caries*], and black chaff (*Bacterium translucens* var. *undulosum*), and of awn characters and colour of the coleoptile, in the three spring wheat crosses Hope × Marquillo, Hope × Supreme, and Marquillo × Supreme, in which Hope is highly resistant to black rust, resistant to bunt, and susceptible to black chaff; Marquillo is moderately resistant to the rust, semi-resistant to bunt, and resistant to black chaff; and Supreme is susceptible to the rust and bunt, but resistant to black chaff. In the Hope × Marquillo cross, inheritance of mature plant reaction to the rust appeared to depend on three or more factors. The factor or factors for the mature plant resistance of the Hope type did not appear to be allelomorphic to those of the semi-resistant type of Marquillo. In the Hope × Supreme cross, inheritance of the mature plant resistance appeared to depend on at least two factors, and in the inheritance of the parental reaction in the Marquillo × Supreme cross at least three factors appeared to be involved. When hypodermically inoculated in the greenhouse with physiologic form 36 of black rust, the F_3 lines of the Hope × Marquillo and Hope × Supreme crosses segregated approximately in the ratio of 1 resistant to 2 segregating to 1 susceptible, while all the F_3 lines of Marquillo × Supreme were susceptible.

While the number of genetic factors involved in the inheritance of reaction to bunt in the three crosses studied could not be determined, the indications were that the susceptibility of the hybrids tends to increase with the higher susceptibility of one or both parents. Similarly, no conclusion could be reached as to the number of factors concerned in the inheritance of reaction to black chaff; segregation occurred in the progenies of the two crosses having Hope as one of the parents, and did not occur in the Marquillo × Supreme cross.

There also was evidence that the following combinations of characters are independent: mature plant reaction to black rust in relation to bunt, seedling reaction (except in Hope × Marquillo), awnedness, and coleoptile character; black chaff in relation to bunt, seedling reaction, awnedness, and coleoptile colour; bunt in relation to seedling reaction, awnedness, and colour of the coleoptile; awnedness in relation to seedling reaction and colour of coleoptile; and seedling reaction in relation to colour of coleoptile. There appeared to be a tendency to linkage or association of mature plant reaction to black rust and seedling reaction in the Hope × Marquillo cross, and mature plant reaction to black rust and reaction to black chaff in the crosses of Hope with Marquillo and Supreme. There did not appear to be any correlation between

reaction to the black rust and stomatal behaviour of the crosses under field conditions.

HAYES (H.K.), AUSEMUS (E. R.), STAKMAN (E.C.), & BAMBERG (R.H.). **Correlated inheritance of reaction to stem rust, leaf rust, bunt, and black chaff in Spring-Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 1, pp. 59–66, 1934.

This is a brief, tabulated report of the authors' genetical studies [cf. preceding abstract] of correlated inheritance of reaction to stem [black] rust (*Puccinia graminis*), leaf [brown] rust (*P. triticina*), bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], and black chaff (*Bacterium translucens* var. *undulosum*) in crosses between the spring wheat variety H–44 (highly resistant to black rust, resistant to brown rust and bunt, and very susceptible to black chaff) as the one parent, and Kota × Marquis No. II–19–167 or Double Cross No. II–21–28, as the other parent, both of which are moderately resistant to black rust, highly resistant to black chaff, susceptible to brown rust, and moderately susceptible to bunt. The results of the experiments, which were made at the University Farm, St. Paul, Minnesota, indicated that inheritance of the mature plant resistance to black rust of the H–44 parent is apparently dependent upon a single genetic factor difference. The moderate resistance of the other two parents appeared to be dependent upon factors not allelomorphic to those of the H-44 type, as susceptible lines were obtained in the F_3 generation. The number of factor pairs responsible for segregation of reaction to brown rust, bunt, and black chaff could not be determined, although a considerable number of resistant types was obtained in all cases. There appeared to be no linkage in the inheritance of reaction to the following combinations of diseases, namely, black rust and bunt, brown rust and bunt, brown rust and black chaff, and black chaff and bunt, but there was evidence of linkage in the inheritance of reaction to black rust and bunt, on the one side, and to black chaff and bunt, on the other. Finally, the results indicated the possibility of combining the mature plant resistance to black rust of the H–44 type with the resistance to black chaff of many varieties and hybrids of common wheat.

GASSNER (G.) & HASSEBRAUK (K.). **Zweijährige Feldversuche über den Einfluss der Düngung auf die Rostanfälligkeit von Getreidepflanzen.** [Two years' field experiments on the influence of manuring on the susceptibility of cereal plants to rust.]—*Phytopath. Zeitschr.*, vii, 1, pp. 53–61, 1934.

The results of field trials fully substantiated those previously obtained by the writers in greenhouse tests [*R.A.M.*, xi, p. 98] as to the promotion of rust (*Puccinia triticina* and *P. glumarum* on wheat, *P. coronifera* [*P. lolii*] on oats, and *P. sorghi* [*P. maydis*] on maize) by nitrogen fertilizers and its suppression by potash [ibid., xiii, p. 83]. It is therefore of the utmost importance to avoid any excess of nitrogen over potash in the manuring scheme.

GASSNER (G.) & HASSEBRAUK (K.). **Der Einfluss der Mineralsalzernährung auf das Anfälligkeitsverhalten der zur Rassen-**

bestimmung von Getreiderosten dienenden Standardsortimente. [The influence of the mineral salt nutrition on the susceptibility relations of the standard varieties serving for the race determination of cereal rusts.]—*Phytopath. Zeitschr.*, vii, 1, pp. 63–72, 1934.

By means of drastic variations in the potash and nitrogen supplies [see preceding abstract] it was possible to induce far-reaching modifications in the reactions of the standard collection of wheats to *Puccinia triticina* form 14 and *P. glumarum* forms 4 and 7, of oats to a Brunswick collection of *P. coronifera* [*P. lolii*: *R.A.M.*, xii, p. 274], and of barley to *P. simplex* [*P. anomala*] form 2 [ibid., xi, p. 36]. Such being the case, it is questionable whether the ordinary procedure of growing the standard varieties for physiologic form determination in field or garden soil gives sufficiently uniform results, or if it may not rather be preferable to grow the plants on a synthetic substratum with a constant nutrient content.

GAßNER (G.) & KIRCHHOFF (H.). **Einige vergleichende Versuche über Verschiebungen der Rostresistenz in Abhängigkeit vom Entwicklungszustand der Getreidepflanzen.** [Some comparative experiments on modifications in rust resistance as conditioned by the state of development of the cereal plants.] —*Phytopath. Zeitschr.*, vii, 1, pp. 43–52, 1934.

Wheat, oats, and barley plants were inoculated throughout the vegetative period with one strain each of *Puccinia triticina* and *P. glumarum* (wheat), *P. coronifera* [*P. lolii*] (oats), and *P. simplex* [*P. anomala*] (barley) in order to determine the applicability to German conditions of the results obtained in the first-named writer's South American experiments on the relation of maturity to reaction to rusts [*R.A.M.*, xi, p. 703].

The experiments on five varieties of wheat with *P. glumarum* form 4 [ibid., xii, p. 272] were only of importance as indicating that the decline of infection in the summer is not due to the increased resistance of older plants. The tests with *P. triticina* form 14 [ibid., xii, p. 274] were confined to older wheat plants, since the young ones succumbed to unfavourable weather and soil conditions. The results confirmed those of the earlier trials in so far as in most varieties the susceptibility of the leaves inserted towards the middle of the stem increased until the time of flowering, while that of the top leaf reached a climax somewhat later. The four varieties of oats and five of barley used in the tests reacted similarly to *P. lolii* and *P. anomala*, respectively, resistance being at its height before tillering. As in the case of *P. triticina* on wheat, the leaves of medium insertion on both oats and barley contract infection by *P. lolii* and *P. anomala*, respectively, before the top one.

RONSDORF (LISELOTTE). **Ueber Plasmolyse und Vitalfärbung bei Sporen und jungen Keimschläuchen von Getreiderostpilzen.** [On plasmolysis and vital staining in the spores and young germ-tubes of cereal rust fungi.]—*Phytopath. Zeitschr.*, vii, 1, pp. 31–42, 2 figs., 1934.

The germination of the uredospores of *Puccinia simplex* [*P. ano-*

mala], *P. triticina*, and *P. coronifera* [*P. lolii*] was very severely impaired by continuous immersion in plasmolysing cane sugar solutions (0·9 to 1·3 mol). In calcium chloride solutions (0·6 to 0·8 mol.) *P. glumarum* was killed and the development of *P. anomala*, *P. dispersa* [*P. secalina*], *P. graminis*, and *P. triticina* impeded, *P. lolii*, however, being unaffected. Calcium chloride appears to penetrate the germ-tubes and spores of the rusts more rapidly than cane sugar, judging by the higher values (based on a calculation of pressure in atmospheres) for the former in the plasmolysis tests. A comparison of the osmotic values of the germ-tubes of *P. anomala* with those of the host cells in inoculated barley plants showed that that of the parasite was considerably higher [cf. *R.A.M.*, xii, p. 713]. Vital staining of the spores of *P. anomala* was accomplished with neutral red (1 in 100,000).

LEVINE (M. N.), COTTER (R. U.), & STAKMAN (E. C.). **The production of an apparently new variety of Puccinia graminis by hybridization on Barberry.**—Abs. in *Phytopath.*, xxiv, 1, pp. 13–14, 1934.

From artificial greenhouse crosses between certain physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, xii, p. 14] and *P. g. secalis* on barberry arose lines capable of normal infection on barley but not on other cereals and thus apparently representing a new variety of the rust. The crosses were *P. g. secalis* 7 × *P. g. tritici* 2, and *P. g. secalis* 7 × *P. g. tritici* 101, the progeny being similar in both cases. Some evidence is also available that *P. g. tritici* 34 × *P. g. agrostidis* produced a rust similar to the above.

HANNA (W. F.) & POPP (W.). **Bunt infection of spring Wheat by soil-borne spores.**—*Scient. Agric.*, xiv, 5, pp. 257–258, 1934. [French summary on p. 291.]

The results of experiments in 1932–3, conducted on the same lines as in the previous year [*R.A.M.*, xii, p. 751], again showed that the viability in the spring of the wheat bunt spores (*Tilletia tritici*) [*T. caries*] that had overwintered in the soil was considerably reduced as compared to that of the spores in wheat heads left over winter on the surface of the ground. In a special experiment, in which formalin-treated seed of the bunt-susceptible Ceres wheat was sown in the spring on small plots artificially infected in the autumn of 1932 with bunted wheat heads, bunt-balls, and sifted spores, it was shown that some of the spores in all three plots survived the winter, the relative amounts of the bunted ears found in the new crop (45, 29, and 11, respectively) indicating that the spores in bunted ears are more likely to retain their viability through the winter than those that overwinter in direct contact with the soil.

BODNÁR (J.) & TERÉNYI (A.). **Zur Biochemie der Brandkrankheiten der Getreidearten. IV. Der Wirkungsmechanismus der Hg-Salze auf die Sporen des Weizensteinbrandes.** [On the biochemistry of the smut diseases of cereals. IV. The

mechanism of the action of Hg-salts on the spores of Wheat bunt.]—*Kisérletügyi Közlemények*, xxxv, pp. 75–86, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 1, p. 11, 1934.]

On a calcium nitrate solution only those mercury methyl-treated wheat bunt [*Tilletia caries*] spores germinate to which no mercury adheres. On damp soil those treated with mercuric acetate also germinated but not those that had been immersed in mercuric chloride or bromide [*R.A.M.*, xi, p. 774]. The effect of the two latter compounds is attributed to the adsorption by the spores, not only of mercury ions, but also of lipoid-soluble molecules which penetrate and destroy them. This does not apply to mercuric acetate, from which only the mercury ions are adsorbed. On account of its greater dissociability mercuric bromide exerts a more potent fungicidal action than mercuric chloride, the former being efficacious at a concentration as low as 0·005 per cent., representing an equivalent of 0·4 per cent. adsorbed mercury. The adsorbed mercury exerts a merely retardatory action on spore growth, similar to but weaker than that produced by copper under like conditions [ibid., x, p. 178]. On the addition of sodium chloride to a mercuric acetate solution, mercuric chloride molecules are formed which penetrate and kill the spores.

NOBLE (R. J.). **Note on the longevity of spores of the fungus Urocystis tritici Koern.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxvii, pp. 403–410, 1934.

In this progress report of his investigation of the longevity of the spores of flag smut (*Urocystis tritici*) of wheat [*R.A.M.*, iii, p. 577], the author states that spores collected in 1923 in New South Wales and kept in the laboratory under conditions of low relative atmospheric humidity, still germinated vigorously in 1933 [cf. ibid., x, p. 371]. No germination was observed at any time during the intervening interval of ten years in the series of spores that were kept at 72·5 and 89 per cent. relative humidity.

MAINS (E. B.). **Inheritance of resistance to powdery mildew, Erysiphe graminis tritici, in Wheat.**—Abs. in *Phytopath.*, xxiv, 1, pp. 14, 1934.

In crosses between the wheat variety Norka C. I. 4377 and Webster, Ceres, Chinese, Kota, Malakoff, Reliance, and Warden, the first-named being resistant and the others susceptible to physiologic form 1 of *Erysiphe graminis tritici* [*R.A.M.*, xii, p. 362], resistance was found to be inherited as a simple dominant factor (3 resistant: 1 susceptible in the F_2 generation). Resistance to mildew in Norka was inherited independently of resistance to physiologic form 3 of leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: ibid., xii, p. 499]. The resistance of Red Fern to mildew was also found to be inherited as a simple, dominant Mendelian factor. The resistance to mildew of Hope C. I. 8178, in crosses with the susceptible Chinese, Marquis, Michigan Amber, and Reliance varieties, was inherited as a simple, recessive Mendelian factor (1 resistant: 3 susceptible in the F_2). In crosses with

Chinese the resistance to mildew of Sonora and of Michigan Amber 29–1–1–1 were also each inherited as a simple, recessive factor.

WEIGERT (J.) & WEIZEL (H.). **Über das Auftreten der Fusskrankheiten bei Getreide, vor allem bei Winterweizen, unter besonderer Berücksichtigung des Einflusses der Vorfrüchte.** [On the occurrence of foot rots in cereals, especially winter Wheat, with special reference to the influence of the preceding crops.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 11, pp. 249–261, 4 figs., 1934.

After summarizing the available information on the control of cereal foot rots, caused mainly by *Cercosporella herpotrichoides* and *Ophiobolus graminis* in Germany [*R.A.M.*, xiii, p. 154], the writers give an account of their observations on the attacks of these fungi in Bavaria.

The cultivation of wheat has only recently become practicable on the very poor, gravelly, loamy sand of the Garching heath near Munich through the application of sludge from the municipal plant. One of two adjacent plots on this land gave a very good yield in 1933, whereas on the other the crop was a total failure owing to early infection by *O. graminis*. The former plot was sown in October, 1932, and received sludge, basic slag, and kainit; the preceding crops were rye interspersed with black medick [*Medicago lupulina*] (1931) and oats (1932), to which a green manure was given. The diseased plot was sown in September, 1932, and received sludge and kainit; the preceding crops in 1929, 1930, 1931, and 1932 were potatoes, summer barley, winter rye, and winter barley, respectively, manured with calcium cyanamide, basic slag, and kainit. The cause of the trouble was evidently the repeated sequence of cereals, with winter barley as the immediately preceding crop, the very early date of sowing being possibly also a contributory factor.

On the experimental farm at Nederling, where the composition of the soil is similar to the foregoing, trials on the effects of fertilizers on the incidence of foot rot in winter rye and wheat alternating with potatoes have been in progress since 1921. *C. herpotrichoides* (predominantly associated with lodging) was definitely more severe on the rye plots manured exclusively with nitrogen or with phosphorus and nitrogen (no potash) than on any of the others, this being in accordance with most recorded observations. There was no apparent increase of infection on the potash-nitrogen plots (no phosphorus) or on those receiving the complete fertilizer with the addition of calcium. Neither in these trials nor in a permanent phosphoric acid series (since 1922) has any evidence been obtained of an increase of foot rot as a result of phosphorus deficiency. Wheat on the experimental farm was chiefly affected by blackleg (*O. graminis*), the incidence of which was not increased by nitrogenous manures. In another test with Tassilo wheat receiving a complete fertilization the highest incidence of blackleg occurred in the plots preceded by summer wheat (99 per cent.) and barley 85 per cent.), the corresponding figures for maize, oats, and broad beans [*Vicia faba*] being 1. 1·3, and 1 per cent., respectively.

The practical bearing of these observations on the system of crop rotation is briefly discussed.

No reduction of foot rot in wheat was effected by deep ploughing under (down to 20 cm.) of the stubble of the preceding barley crop.

SPRAGUE (R. A.). **The relative importance of Cercosporella herpotrichoides and of Leptosphaeria herpotrichoides as parasites of winter cereals.**—*Phytopath.*, xxiv, 2, pp. 167–168, 1934.

In the mycological collections of the Bureau of Plant Industry *Cercosporella herpotrichoides* is stated to occur on specimens of diseased wheat collected in Norway by E. Bachala and E. C. Stakman and labelled *Leptosphaeria herpotrichoides* [*R.A.M.*, xiii, p. 297]. From conversation with Dr. O. Aamodt, University of Alberta, who has seen the strawbreaker foot rot in Sweden, it appears that the symptoms of the disease in that country are practically identical with those in the United States [ibid., x, p. 719]. *C. herpotrichoides* is an active parasite, while inoculation experiments with pure cultures of *L. herpotrichoides* from France and Canada revealed its weakness as a pathogen. In the writer's opinion, *C. herpotrichoides* is responsible for most of the damage to wheat attributed to *L. herpotrichoides* in Europe.

GARRETT (S. D.). **Factors affecting the severity of take-all.**—*Journ. Dept. Agric. S. Australia*, xxxvii, 6, pp. 664–674, 1 fig., 1 graph, 1934.

Epidemics of wheat take-all (*Ophiobolus graminis*) in South Australia are mostly confined to the light, sandy soils of the 'mallee' and west coast areas during the first twenty or thirty years of cultivation; on older soils of this type and on the heavier clay-loam of the Adelaide Plains severe outbreaks occur only under exceptional conditions, such as follow the ploughing-in of infected grass or stubble.

Field and laboratory tests [which are fully described] demonstrated that infection occurs much more rapidly in lighter than in heavier soils, but the difference in the rate of growth of the fungus in the two classes of soil was completely eliminated by soil sterilization, definite evidence being obtained that the retardation of infection noted in the heavy soils was due to micro-organisms which impeded the external spread of the hyphae along the roots, not to the resistance of the wheat plants. Infection was inversely related to the bacterial numbers in the soils tested. Any measures which increase the organic content of the light, sandy soils should decrease infection correspondingly.

A quantitative method for the estimation of infection by *O. graminis* under different soil conditions by the direct measurement of the growth rate of the runner hyphae along the roots of wheat seedlings is described. Further investigations are in progress.

YOUNG (P. A.). **Sclerotium blight destroys winter Wheat in Gallatin County, Montana.**—Abs. in *Phytopath.*, xxiv, 1, p. 21, 1934.

In April, 1932 and 1933, numerous sclerotia, apparently of

Sclerotium fulvum, were found on the straw of Turkey wheat and on dead stems of *Sisymbrium altissimum* in Montana. The disease due to this fungus was confined to land on which *Sclerotium*-killed wheat leaves were collected at the same time and in the preceding year [cf. *R.A.M.*, xiii, p. 223]. On maize meal agar at 5° C. the sclerotia from overwintered wheat and *Sisymbrium* stems produced sparse, hyaline hyphae and numerous reddish-brown sclerotia, 700 to 1,200 μ in diameter (200 to 900 μ when dry). On the melting of the snow from infested fields, white, tan, or grey, unshrivelled wheat leaves were seen to be flattened against the soil; they had been killed by *S. fulvum* and bore a number of reddish-brown to black sclerotia, 200 to 500 μ in diameter. Plants surviving winter blight developed pale heads with shrivelled grain. No resistance to spontaneous infection was shown by 40 wheat varieties, but autumn-sown seed, emerging in the spring, escaped the disease.

STANTON (T. R.), MURPHY (H. C.), COFFMAN (F. A.), & HUMPHREY (H. B.). **Development of Oats resistant to smuts and rusts.** —*Phytopath.*, xxiv, 2, pp. 165–167, 1934.

Very promising results in the development of oats strains combining resistance to stem [black] rust (*Puccinia graminis avenae*), crown rust (*P. coronata avenae*) [*P. lolii*: *R.A.M.*, xiii, p. 156], and loose and covered smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) have been obtained in the writers' recent experiments at Ames, Iowa, with crosses between Victoria and Richland [ibid., xiii, p. 296]. The F_3 progeny were exposed to both greenhouse and field epidemics of the rusts and smuts with highly satisfactory results as regards resistance, but their productivity and adaptability to agricultural conditions require further testing.

SPRAGUE (R.). **A physiologic form of Septoria tritici on Oats.**— *Phytopath.*, xxiv, 2, pp. 133–143, 2 figs., 1934.

Winter Turf and Red Rustproof oats growing in an acid soil in the Alsea River Valley, Oregon, were severely attacked in 1930 to 1932 by a leaf spot due to a *Septoria*, closely similar to one also found on *Holcus lanatus* in the vicinity. The lesions on oat leaves and sheaths are grey, irregular or rectangular, and sometimes bordered by greenish-yellow areas. The prominent, subepidermal and substomatal, subglobose to globose or ellipsoid, amber-brown to black-walled pycnidia measure 60 to 145 by 40 to 100 μ (average 95 by 74 μ) and exude short, pale flesh-coloured cirrhi of cylindrical, hyaline, 1- to 7-septate pycnospores, 35 to 120 by 1·6 to 3·5 μ (70 by 2·2 μ). The hyphae within the host cells are yellow to olive-brown and average 2 μ in diameter.

The slender spores of the fungus and its slow, yeast-like growth in pure culture on potato-dextrose agar differentiate it from *Leptosphaeria avenaria* Weber (*S. avenae* Frank) [*R.A.M.*, ix, pp. 225, 625] and indicate a close relationship with *S. tritici* Desm. [ibid., ii, p. 212], of which it is accordingly considered to be a physiologic form synonymous with *S. graminum* var. *C. avenae* Desm. The form on oats did not infect wheat, barley, or rye in inoculation

tests, while the form or forms on wheat have not been observed on oats.

STAKMAN (E. C.), MOORE (M. B.), & CASSELL (R. C.). **The pathogenicity and cytology of Urocystis occulta.**—Abs. in *Phytopath.*, xxiv, 1, p. 18, 1934.

At soil temperatures of 14°, 19°, 24°, and 29° C. the following flag smut (*Urocystis occulta*) [*R.A.M.*, xii, p. 751] percentages developed in rye plants from inoculated seed: 47, 35, 24, and 0, respectively. The 139 selfed lines of rye tested for smut reaction under Minnesota conditions ranged from highly resistant to completely susceptible. No conclusive evidence of physiologic specialization was obtained from the inoculation of eight rye varieties with five collections of *U. occulta*. The spores produce a promycelium on which are formed two to six uninucleate sporidia. Fusion of sporidia on the same or different promycelia is effected in various ways, giving rise to binucleate hyphae of the dikaryophase. Within the host the vegetative hyphae appear predominantly binucleate, the diplophase resulting from nuclear fusions in the spore-mother cells.

BECK (E. C.). **The precipitin ring test applied to some Ustilaginaceae.**—*Canadian Journ. of Res.*, x, 2, pp. 234–238, 1934.

The standard precipitin ring test [*R.A.M.*, xiii, p. 117] was applied [by methods which are detailed] with a view to the differentiation of the following smut fungi: (1) monosporidial cultures of *Sorosporium reilianum* [ibid., xii, p. 563], *Ustilago hordei*, *U. levis* [*U. kolleri*], and *U. zeae* from Minnesota, and (2) mass cultures of *U. hypodytes* (Schlecht.) Fr. from *Agropyron repens* [ibid., ix, p. 459], *U. tritici*, *U. avenae*, *U. kolleri*, and *U. zeae*, all isolated in Ontario.

The results [which are tabulated] indicated that the monosporidial cultures can be satisfactorily differentiated by testing with the serum of rabbits inoculated with the ground cultures filtered after extraction with 0·85 per cent. sodium chloride. Although they were frequently mutually reactive in undiluted serum-antigen mixtures, their specificity was apparent in the persistence of the precipitin ring at stronger dilutions with homologous than with heterologous mixtures. With mass cultures the technique was less successful, numerous cross reactions being shown. It was found that closely related species and physiologic forms are not easily differentiated since characters common to two or more of them apparently tend to mask their differences. The precipitin ring test, however, does offer possibilities of determining the closer affinities among groups of doubtful species or genera.

SMITH (G. M.) & TROST (J. F.). **Diplodia ear rot in inbred and hybrid strains of sweet Corn.**—*Phytopath.*, xxiv, 2, pp. 151–157, 1 fig., 1 graph, 1934.

Little difference was observed between Dent and sweet maize as regards natural infection by *Diplodia zeae* [*R.A.M.*, xiii, p. 218], recognized to be the most serious cause of maize ear rot in the United States, in trials with a large number of strains under

conditions favouring the disease in Indiana. No marked correlation was found, moreover, between the percentage of infected ears in the inbred strains of sweet maize used as parents and that in the F_1 crosses between them. The results of the experiments [which are tabulated and briefly discussed] indicate that the losses due to *D. zeae* may be reduced to some extent by breeding and selection for resistance, the most striking response to which was shown by the Country Gentleman strains, with a reduction from 18·5 to 3·5 per cent., and the least by Golden Bantam (8·3 to 7·5), during the first five years' tests.

TAKASUGI (H.) & AKAISHI (Y.). **Studies of the downy mildew (Sclerospora graminicola setariae-italicae) on Italian Millet in Manchuria. I, about the germination of the oospores.**—*S. Manchuria Ry. Co. Agric. Exper. Stat. Res. Bull.* 11, pp. 1–20, 8 pl., 1933. [Japanese, with English abstract. Abs. in *Exper. Stat. Record*, lxx, 4, pp. 489–490, 1934.]

Field investigations in 15 districts of Manchuria from 1927 to 1929 revealed 10 to 25 per cent. damage to Italian millet (*Setaria italica*) by downy mildew (*Sclerospora graminicola*) [*R.A.M.*, xii, p. 623], the oospores of which have been found to remain viable for over eight years. The following fungicides proved toxic to these spores: tillantin, uspulun, semesan, mercuric chloride, copper sulphate, and formalin, and they were also killed by the hot-water treatment. Field experiments demonstrated the value of crop rotation and seed disinfection in the control of the disease.

TAKASUGI (H.) & AKAISHI (Y.). **Studies on the smuts of Sorghums. I, germination of spores of the loose kernel smut (Sphacelotheca cruenta) of Sorghum.**—*S. Manchuria Ry. Co. Agric. Exper. Stat. Res. Bull.* 11, pp. 21–60, 9 pl., 1933. [Japanese, with English abstract. Abs. in *Exper. Stat. Record*, lxx, 4, p. 492, 1934.]

Sorghum in Manchuria was found to be damaged to the extent of 20 or 30 per cent. by *Sphacelotheca cruenta*, *S. sorghi* [*R.A.M.*, xiii, p. 227], and *Sorosporium reilianum* [ibid., xii, p. 617]. The spores of *S. cruenta* were found to reach maturity in about 17 days from the time the diseased head breaks out from the leaf sheath. In the laboratory the spores retained their viability for four years, but those from infected heads kept on and in the soil out of doors did not survive the winter. The optimum temperature for germination was found to be 25° C., with a minimum above 12° and a maximum under 43°. Good control was obtained by seed-grain disinfection with formalin, copper sulphate, semesan, uspulun, tillantin, or lime-sulphur, as well as by the hot-water treatment.

CARRERA (C.). **Informe preliminar sobre una enfermedad nueva comprobada en los Citrus de Bella Vista (Corrientes).** [A preliminary note on a new disease observed among the Citrus plantings of Bella Vista (Corrientes).]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxiv, 2–3, pp. 275–280, 4 figs., 1933. [Received April, 1934.]

In 1933 the writer investigated a root rot affecting up to 75 per

cent. of the trees in the Bella Vista (Corrientes) citrus plantings. The first symptom of the disease is the gradual yellowing of the leaves of the terminal shoots, which subsequently shrivel and rapidly fall. The shoots wither and assume a whitish colour; on their surface appear large quantities of acervuli of *Colletotrichum gloeosporioides*. The leaf fall proceeds from above downwards and from the periphery to the centre of the tree; the fruits beginning to form remain small and yellow, shrivelling and falling in large numbers. On removing the cortex at the base of the tree a mouldy smell is evident. The diseased roots, down to the smallest, are abnormally dark-coloured and shrunken, the fragile, cracked bark readily peeling off. Intra- and intercellular hyaline, septate hyphae of regular diameter occur in the cortex down to the cambium, and sometimes in the medullary rays of the wood. Inoculation experiments are in progress with various species of *Fusarium* isolated from the diseased roots.

The infected plantings are situated on sandy soils, poor in nutrient substances, of acid reaction, and having a shallow, impermeable subsoil. Cultural methods are defective. The root rot appears chiefly to affect bitter oranges (*Citrus aurantium*) [var. *bigaradia*], limes (*C. aurantifolia*) remaining immune even when surrounded by diseased trees, while neither lemons nor grape-fruit are known to contract infection. Control measures should be based on the eradication and destruction of diseased material, disinfection of wounds, and improved cultivation and drainage.

Among other diseases observed during the writer's visit of inspection were eruptive leprosy (*Amylorosa aurantiorum*) [*R.A.M.*, x, p. 24], foot rot (*Phytophthora terrestris*) [*P. parasitica*], scab (*Sphaceloma fawcettii*) [ibid., xiii, p. 386], anthracnose (*Colletotrichum gloeosporioides*), melanose (*Phomopsis*) [*Diaporthe citri*: ibid., xiii, p. 26], and foliar gummosis [ibid., x, p. 25; xii, p. 760]. Bacteria were isolated in large numbers from lesions resembling those caused by *Bacterium* [*Pseudomonas*] *citri* [ibid., xi, p. 415], but inoculation experiments with the organisms gave negative results.

VAN DER PLANK (J. E.). **Sooty blotch on Citrus fruits.**—*S. Africa Dept. of Agric. Sci. Bull.* 121, 12 pp., 2 figs., 1933. [Received April, 1934.]

This is an expanded account of the writer's studies on the symptomatology, distribution, and control of sooty blotch of citrus (*Gloeodes pomigena*) in South Africa, a note on which has already been published [*R.A.M.*, xii, p. 759]. The disease is troublesome in places and is possibly on the increase, no variety of citrus being immune. Besides the treatment with bleaching powder (chloride of lime) experiments are in progress for the prevention of infection by spraying with lime-sulphur. It is stated that fly speck of citrus (*Leptothyrium pomi*) also occurs in South Africa, but is rare.

THOMPSON (D. J.). **Develop method for using zinc for brown rot gummosis.**—*California Citrograph*, xix, 3, p. 65, 1 fig., 1934.

Very satisfactory results in preventing the onset of brown rot gummosis [*Phytophthora citrophthora*: *R.A.M.*, xiii, p. 301] until after the susceptible stage had passed were obtained on over 16,000

young lemon trees budded on sweet orange stock in California by placing a band of cheap, durable building paper round the trunk, exposing the crown roots so that the paper (which extended up to the bud union but is expected to be more effective if made high enough to reach above the latter) rested on them, and filling the cavity between the trunk and the paper with a mixture of 25 per cent. each of zinc sulphate (containing 25 per cent. zinc) and hydrated lime and 50 per cent. sand. The average cost was 5 to 6 cents for each tree. Next season the filling will probably consist of 40 per cent. each of zinc sulphate and sand and 20 per cent. hydrated lime.

REED (H. S.) & DUFRÉNOY (J.). **Effets de l'affection dite 'mottle leaf' sur la structure cellulaire des Citrus.** [Effect of the so-called 'mottle leaf' disease on the cytological structure of Citrus trees.]—*Rev. Gén. de Botanique*, xlvi, 541, pp. 33-44, 10 figs., 1934.

An account is given of the authors' comparative studies of the cytological structure of the terminal buds of healthy citrus shoots and of shoots affected with mottle leaf [*R.A.M.*, xi, p. 570]. The results showed that in cells affected with mottle leaf, the volume of the cytoplasm is very considerably reduced; the chromidia and the few primordia of chloroplasts tend to aggregate at one pole of the cell along strands of cytoplasm which include small vacuoles, while a large vacuole, surrounded by a thin wall of cytoplasm, occupies the rest of the cell. The palisade cells of the leaf have a feeble photosynthetic activity owing to their deficiency in plastids, while those of the spongy parenchyma contain an accumulation of starch which is not depleted when the leaf is placed in darkness and which seems to be the result of a storage of starch formed in the normal green tissues outside the affected areas and incapable of being utilized by the affected cells.

AFZAL (M.). **A note on a growth abnormality of Punjab-American Cottons.**—*Indian Journ. Agric. Sci.*, iii, 5, p. 933, 1933. [Received May, 1934.]

A brief account is given of the symptoms of a growth abnormality, apparently of the nature of a virus disease, which was first noticed in 1930 on American varieties of cotton grown in the Canal Colonies of the Punjab, and which again reappeared with considerably intensified severity in 1932. The trouble is stated to be similar to Cook's 'stenosis' of cotton in Haiti [*R.A.M.*, iii, p. 272], and is characterized by an extreme stunting of the aerial organs of the host. The leaves are crinkled, deformed, with yellowish patches giving them a distinctive mosaic appearance, and the number of the leaf lobes is reduced. The stipules are usually of normal size but very light in colour. The epicalyx is discoloured but not deformed. A large proportion of the developing buds and young bolls on the diseased plants are shed, and the few bolls which are formed are very small and contain few viable seeds. A direct relationship was also noticed between the degree of severity of attack on the aerial organs and the size of the root system. The disease first appears in the field when the plants are six

weeks old, and is stated to be particularly virulent during August. Indigenous cottons seem to be entirely immune from the disease.

MARCHIONATTO (J. B.). **Parasitos vegetales de la langosta.** [Vegetable parasites of the locust.] *ex* **Parasitos más importantes de la langosta ('Schistocerca paranensis' Burm.).** [The most important parasites of the locust (*Schistocerca paranensis* Burm.)]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxiv, 2–3, pp. 227–245, 4 col. pl., 6 figs., 1933. [Received April, 1934.]

Notes are given on the pathogenicity, life-history, and taxonomy of the following parasites of the locust (*Schistocerca paranensis*) in the Argentine Republic: *Coccobacillus acridiorum* d'Hérelle, *Sporotrichum paranense* n. sp. [*R.A.M.*, xiii, p. 302], and *Fusarium* sp.

The most conspicuous symptom of infection by *S. paranense* is the vivid red colour of recently dead insects, which later assume a nacreous-white tinge and become mummified. The internal organs develop a profuse greenish efflorescence consisting of the reproductive bodies of the fungus and visible through the body wall. *S. paranense* is readily cultivable on a number of standard media, on which it forms pulverulent, emerald-green colonies surrounded by a sparse zone of white mycelium. The latter is composed of hyaline, septate, very slender hyphae (2 to 2·5 μ), thickening with age and anastomosing; the short, sparsely branched, more or less clavulate conidiophores bear at their apices cylindrical to ellipsoid or ovoid, greenish-yellow, acrogenous conidia, occurring singly or in chains and germinating by means of two or three germ-tubes. Details are given of a number of inoculation experiments from which it appeared that the first symptoms may develop in three or four days and death in from eight to ten days after inoculation. It was impossible to ascertain the exact mode of infection.

S. paranense ('the fungus of Caracaná') is stated to have been originally detected in 1897 by L. Bruner, who recognized it as a *Sporotrichum* but was unable to furnish a specific name (*Bol. Agric. Gan.*, iii, p. 1088, 1903). Specimens submitted to Spegazzini were identified as *S. globuliferum* (R. J. Huergo: *Informe An. Ofic. Nac. Agric.*, iv, p. 54, 1898), a determination which was later shown to be incorrect.

A species of *Fusarium* allied to *F. acridiorum* [ibid., viii, p. 380] was found covering the eggs with a white, cottony, septate mycelium. The fungus developed well on standard media, producing uni- or bi-cellular, fusoid, slightly curved, hyaline microconidia, 15 to 18 by 3·5 to 4 μ, and fusoid, curved, hyaline macroconidia, often triseptate, with a short pedicel, measuring 30 to 40 by 3·8 to 4 μ. The affected eggs eventually acquire a waxy consistency.

MÜLLER (W.). **Untersuchungen über die Symbiose von Tieren mit Pilzen und Bakterien. III. Mitteilung. Über die Pilzsymbiose holzfressender Insektenlarven.** [Studies on the symbiosis of animals with fungi and bacteria. Note III. On the fungal symbiosis of wood-devouring insect larvae.]—*Arch. für Mikrobiol.*, v, 1, pp. 84–147, 29 figs., 2 graphs, 1934.

A comprehensive account is given of the writer's studies at the

Karlsruhe Technical College on fungal symbiosis in a number of wood-devouring insect larvae.

The symbionts of *Ernobius abietis*, *E. mollis*, *Rhagium bifasciatum*, *R. inquisitor*, *R. mordax*, and *Leptura rubra* are Pseudosaccharomycetes, whereas that of *Sirex gigas* formed in pure culture a typical Hymenomycetous mycelium with clamp-connexions, though fruit bodies were not produced. The microflora of the intestinal tract and feeding galleries of the insects examined consisted largely of green species of *Penicillium*, though several other genera were also represented.

Buchner's assumption that the fungal symbionts assist in the ingestion of wood by the insects [*R.A.M.*, vii, p. 511] could not be verified in the writer's investigations. Pending further research, the function of the fungal associates of the wood-inhabiting Anobiidae and Cerambycidae may be interpreted as a very weak, regular, hereditary parasitism. No definite statement is possible at this stage regarding the nature of the phenomenon in *S. gigas*, but there seems little probability that the insect acts as a breeding ground for fungi as in the case of the ambrosia beetles.

A bibliography of 55 titles is appended.

Fyg (W.). **Beitrag zur Kenntnis der sog. 'Eischwarzsucht' der Bienenkönigin (Apis mellifica L. ♀).** [A contribution to the knowledge of the so-called 'egg melanosis' of the queen bee (*Apis mellifica* L. ♀).]—*Landw. Jahrb. der Schweiz*, xlviii, 1, pp. 65–94, 32 figs., 1934. [French and Italian summaries.]

After summarizing the literature on 'egg melanosis' in the queen bee (a condition characterized by the progressive conversion of the contents of the ovarian duct into yellowish-brown to brownish-black masses, ending in sterility), and describing the normal anatomy and histology of the organs affected, the writer gives a detailed account of his investigations on the disease at the Federal Dairy and Bacteriological Institute, Liebefeld, Berne.

Of the three queen bees exhaustively examined, one showed a diseased condition of the ovaries and rectum, which were occupied by brown or black masses, while many of the ovarioles were abnormally small and with few or no egg origins, and small yeast-like bodies occurred in the epithelial tissues of the egg sacs and ducts and of the rectum, but not within the eggs themselves. The same disease in the second (unfertilized) queen was localized in the venom bladder of the sting, while in the third case the reproductive organs contained the same brownish-black masses as in the first case but no trace of the yeast-like cells in the epithelial tissues was detected. The dark-coloured masses are of two types, viz., small, and compact or cyst-like, the latter consisting of a finely granular substance surrounded by a black, tuberculate crust. The granular substance is composed of polymorphic, elliptical (2·5 to 3·5 by 1·2 to 2 μ) or rod-shaped (3·5 to 5·6 by 0·8 to 1·2 μ) structures, frequently containing 1 or 2 nuclear bodies. Many of the structures show a tendency to yeast-like budding. The brown to black marginal zone is often occupied by larger bodies (2·8 to 4·8 by 1·6 to 2·8 μ) in process of envelopment by a thick, yellowish-brown membrane, the gradual agglomeration of which appears ultimately

to produce the typical dark masses associated with the diseased organs. These are considered to be merely later stages of the yeast-like isolated bodies observed in the epithelial tissues. It can hardly be doubted that the foregoing are phases in the life-history of a fungous parasite, further weight being lent to this supposition by the Gram-positive reaction of the bodies and their active penetration of the tissues. Moreover, hyphal forms were observed in the rectum of the first of the above-mentioned bees which are strongly reminiscent of certain species of *Oidium* or *Monilia*.

Discussing the terminology of the disease, the writer suggests the discontinuance of the word 'egg' as a prefix to melanosis, the condition being by no means restricted to the reproductive system and the eggs themselves showing no evidence of involvement. The use of the German equivalent 'Schwarzsucht' is inadvisable owing to the risk of confusion with another disease of bees. Of the various possible channels of infection, the rectum appears to be the most probable, and there seems to be no reason why the workers should not also contract the disease and act as carriers of the fungus to the queen while supplying the latter with nutriment.

WACHOWIAK (M.), MARR (J.), HAGEBUSCH (O. E.), RANDALL (W. A.), & FLEISHER (M. S.). **Differentiation of various strains of Monilia by cultural methods.**—*Journ. Infect. Dis.*, liv, 1, pp. 35–44, 1934.

The writers' study, since 1921, of the validity of fermentative activity in the Moniliae as a basis for specific differentiation showed that the irregularities in the action of the 92 strains of *Monilia* (isolated from the human body) under observation on the carbohydrate media tested were so great that this method for specific differentiation seems scarcely justifiable [cf. *R.A.M.*, xii, p. 568; xiii, p. 370].

Other criteria examined for this purpose with unsatisfactory results were the appearance of the growth on solid media, the development of top or bottom growth in fluid ones, the morphology of the stained organisms, and the formation of outgrowths or the type of outgrowths from plate colonies.

LANGERON (M.). **Mycose oculaire primitive due au 'Beauveria brumpti'.** [Primary ocular mycosis due to *Beauveria brumpti*.] —*Bull. Acad. Méd.*, cxi, 3, pp. 133–137, 1934.

Beauveria brumpti n. sp. is the name given to a fungus isolated from a case of kerato-conjunctivitis in a 17-year-old European girl resident in Cairo. The farinaceous consistency of the colonies and their pink coloration (in addition to morphological characters to be discussed elsewhere) sufficiently differentiate the new species from the known entomogenous species of the genus. This is believed to be the first authenticated case on record of a *Beauveria* as a human pathogen.

HOOGLAND (H. J. M.). **Mucormycose bij een varken.** [*Mucor* mycosis in a pig.]—*Tijdschr. Diergeneesk.*, lix, pp. 1156–1163, 1932. [Abs. in *Veter. Bull.*, iv, 4, pp. 220–221, 1934.]

The liver and kidneys of a three-months-old slaughtered pig

examined at the Utrecht University Pathological Institute were found to contain scattered nodular areas, 2 to 2·5 cm. in diameter, a few haemorrhagic infarcts being also present in the kidneys. Microscopic inspection revealed *Mucor* infection in the inflammatory areas of both organs [cf. *R.A.M.*, xiii, p. 238], the mycelium of the fungus being detected in the blood-vessels, larger bile ducts of the liver, and glomeruli and tubules of the kidneys [see next abstract].

BAUDET (E. A. R. F.). **Mucor pusillus Lindt als oorzaak van mycose bij het varken.** [*Mucor pusillus* Lindt as the cause of mycosis in the pig.]—*Tijdschr. Diergeneesk.*, lix, pp. 1163–1164, 2 pl., 1932. [Abs. in *Veter. Bull.*, iv, 4, pp. 220–221, 1934.]

The fungus isolated from the liver and kidneys of the pig referred to in the preceding abstract was identified as *Mucor pusillus* Lindt [*R.A.M.*, xii, p. 693; xiii, p. 238]. A rabbit injected intravenously with 0·5 c.c. of a 14-day-old culture died within five days, and a post-mortem examination of the kidneys disclosed multiple minute areas occupied by mycelium.

HAINES (R. B.) & SMITH (E. C.). **The storage of meat in small refrigerators.**—*Dept. Sci. & Indus. Res. Food Invest. Board, Special Rept.* 43, 30 pp., 1 fig., 9 graphs, 1933. [Received May, 1934.]

Studies [which are fully described] made at the Low Temperature Research Station, Cambridge, of the fungal and bacterial spoilage occurring on meat stored in small refrigerators showed that stickiness may result not only from the slime caused by organisms of the *Achromobacter* group, but also from persistent mould growth. Although a certain amount of mould may accompany a slime, if *Achromobacter* multiplies rapidly mould growth is largely inhibited on the lean, while still taking place on the fat. The fungus most commonly present on meat under the conditions tested is *Thamnidium chaetocladioides* [*R.A.M.*, xi, p. 574]. Moulds and bacteria impart different characteristic flavours to lean meat, some persons objecting to the taint of *Thamnidium* but tolerating that of *Achromobacter*, and vice versa. The moulds liable to be deposited on the carcasses in the slaughter-house are mostly *Thamnidium* or *Penicillium* spp., and the bacteria almost invariably of the *Pseudomonas* and *Achromobacter* groups [ibid., xiii, p. 304]. In connexion with the development of slime in joints hung at various temperatures, Smith and Tomkins are stated to have ascertained that the storage life of lean meat heavily inoculated with spores of *Thamnidium* was eight to ten days at 0° C., though stickiness might result in about three days at this temperature if the meat was inoculated with vegetative hyphae. The moulds commonly found on meat, i.e., *Cladosporium herbarum*, *T. chaetocladioides*, *T. elegans*, *Sporotrichum carnis* [ibid., xi, p. 199], *Dematium pullulans*, *Penicillium* sp., and *Mucor mucedo* have, in general, an optimum temperature for germination and growth of about 20°; reducing the storage temperature to 0° would ensure a storage life for meat exposed to infection by moulds two and a half to three times as long as that resulting from storage at 5°. As the

average storage temperature possible in commercial practice is a few degrees above 0° every effort should be made to keep contamination in the slaughter-house as low as possible.

Notes are also given on tests with various chemicals for the prevention of decay, none of which was found likely to be a substitute for clean and careful handling.

VERNON (T. R.). **The deterioration of dairy-produce by moulds.**—*New Zealand Journ. of Sci. & Techn.*, xv, 4, pp. 237–247, 5 figs., 1934.

The writer describes the results of his examination over a period of one year of New Zealand butter and cheese on arrival in London. Common contaminants of the former (in order of prevalence) [cf. *R.A.M.*, xiii, p. 97] are *Penicillium* spp., *Oospora lactis*, *Phoma* spp., *Fusarium* spp., *Cladosporium herbarum*, *Aspergillus* spp., *Trichoderma lignorum*, *T. roseum*, *Sporotrichum carnis*, and *Scopulariopsis brevicaulis* var. *glabra*. *C. herbarum* is the principal agent of internal spotting, but appeared in only 10 of the 280 samples examined. *Phoma* spp. and a species of *Alternaria* caused large, spreading, muddy-brown blemishes, *F. culmorum* was twice associated with an extensive bright reddish area, while *Penicillium* and *Aspergillus* spp. are the agents of green surface growths.

The most important source of infection is thought to be the condensation water accumulating on boxes of butter after removal from cold storage. As a rule, the temperature conditions obtaining in transport and storage are sufficiently low to prevent fungal development, but on removal from storage after four months the moulds are capable of almost immediate resumption of growth. Glycerine and salt are frequently used to treat parchment wrappers for Australian and Danish butters, respectively; both were found (contrary to expectation in the case of salt) to increase susceptibility to mould infection [cf. ibid., xi, p. 716].

Internal discoloration of butter due to *C. herbarum* was found to affect only unsalted or slightly salted samples, the contamination of which takes place during manufacture. The defect develops on unsalted butter within four to six days after removal from storage under favourable conditions, in slightly salted within six to ten. It would take three weeks to appear in the salted product, which is consumed before this time.

P. roqueforti [ibid., viii, p. 676] was consistently isolated from moulded cheese, infection taking place through crevices below the crown. No definite evidence is forthcoming for the assertion that fungi are responsible for the bluish-black, muddy, pink, and bleached areas recently observed on annatto coloured cheese [ibid., xii, p. 696].

OCFEMIA (G. O.) & BUHAY (G. G.). **Bunchy-top of Abacá, or Manila Hemp: II. Further studies on the transmission of the disease and a trial planting of Abacá seedlings in a bunchy-top devastated field.**—*Philipp. Agric.*, xxii, 8, pp. 567–581, 2 figs., 1934.

Bunchy top of abacá (*Musa textilis*) in the Philippines [*R.A.M.*, xi, p. 300] has not been found to occur spontaneously on bananas

(*M. sapientum* and *M. cavendishii*), to which, moreover, it cannot be transmitted by *Pentalonia nigronervosa* [ibid., xiii, p. 111]. The authors' experiments [which are briefly described] are considered to be difficult to explain except on the assumption that the virus of banana bunchy top in Australia is different from that on abacá in the Philippines. Twelve hours was found to be the minimum period required by *P. nigronervosa* for the assimilation of the bunchy top virus from diseased abacá plants and its transmission to healthy abacá seedlings. The virus can cause infection after undergoing an incubation period of 24 to 48 hours within the insect. In fast-growing seedlings the incubation period of the disease is shorter (30 to 32 days) than in slow-growing ones (60 to 72 days). The abacá bunchy top virus is not transmissible to the progeny of viruliferous aphids. Unlike the viruses of the mosaic group, that of bunchy top is not transmissible to healthy abacá plants by the pin-prick method [ibid., ix, p. 678 *et passim*].

In the rehabilitation of an abacá field devastated by bunchy top, the complete removal of all the existing stools is necessary and replanting should not be attempted immediately. The removal of the plants exposes the soil to drying out, the injurious effects of which may be minimized by the use of larger plants and by irrigation during the dry season following the rainy months. Suckers should be obtained exclusively from disease-free regions.

HUBER (G. A.) & JONES (L. K.). **The Verticillium disease of Chrysanthemums.**—*Washington Agric. Exper. Stat. Bull.* 290 (*Technical Paper*), 14 pp., 4 pl., 1934.

From wilted greenhouse chrysanthemums in the State of Washington [*R.A.M.*, xi, p. 375] the authors isolated two culturally distinct forms of *Verticillium dahliae*, of which one (No. 14) formed pseudosclerotia, and the other (No. 26) a compact crust, when grown on various media. Both were frequently isolated from the same plant. Greenhouse observations and inoculation tests showed 24 [listed] varieties to be resistant and 9 highly susceptible. Although two varieties showed 100 per cent. susceptibility when inoculated with either form, the disease was much more severe when No. 26 was used. Certain other varieties were attacked by one only of the two forms in inoculation tests and these always yielded the same type in isolations from natural infections.

PASSALACQUA (T.). **La variegatura patologica del Pelargonium ed altre piante.** [Pathological variegation of *Pelargonium* and other plants.]—*Lavori R. Ist. Bot. di Palermo*, iv, pp. 201–240, 5 pl., 3 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiv, 1–2, p. 71, 1934.]

From spotted leaves of *Pelargonium*, acacia [*Robinia pseud-acacia*], and palms at Palermo the author isolated a bacterium of the *Bacterium barkeri* group [*R.A.M.*, iv, p. 469], inoculations with pure cultures of which produced similar (though not identical) symptoms on previously healthy *Pelargonium* and *R. pseud-acacia* leaves.

GREEN (D. E.). **Antirrhinum rust. A disease new to Great Britain.**—*Journ. Roy. Hort. Soc.*, lix, 1, pp. 119–126, 2 pl., 1 fig., 1934.

An expanded account is given of the writer's investigations at the Royal Horticultural Society's Garden, Wisley, Surrey, on the symptoms, life-history, and control of *Antirrhinum majus* rust (*Puccinia antirrhini*), recorded for the first time in Great Britain in 1933 [*R.A.M.*, xii, p. 764]. The disease is said to have been discovered in California and Oregon in 1895 and to be considered by growers in the United States to be the most serious disease of antirrhinums grown under glass. As the sporidia borne by germinating teleutospores will not infect the same host it appears that the aecidial stage may occur on some alternate host which is still unknown.

GREEN (D. E.). **Antirrhinum rust.**—*Gard. Chron.*, xcv, 2458, p. 81, 1 fig., 1934.

There seems to be little doubt that the snapdragon (*Antirrhinum*) [*majus*] rust (*Puccinia antirrhini*), detected for the first time in England in the summer of 1933 [see preceding abstract], is capable of overwintering in its new habitat, since vigorously germinating uredospores were found on the leaves of a batch of seedlings received at the Royal Horticultural Society's Laboratory in the second week of January, 1934. The disease spread rapidly during the past season in south-eastern England, where some 60 cases were reported by the Ministry of Agriculture's Laboratory, and a fresh outbreak in the coming summer may be anticipated. The Ministry of Agriculture recommends soil disinfection with a solution consisting of 1 lb. copper sulphate in 10 galls. of water, while the sulphur dust treatment used by O. Butler in the United States [*R.A.M.*, iii, p. 214] may also be effective in this country, particularly in the greenhouse.

BROWN (NELLIE A.). **Control of crown and root rot of Paeonies in America.**—*Gard. Chron.*, xcv, 2460, p. 114, 1934.

In this note (reprinted from the *American Paeony Society Bulletin*) the writer states that the immersion of peony roots (after excision of the diseased portions) in hot water (120° F.) for 30 minutes, primarily against the root-knot nematode [*Heterodera marioni*], incidentally gave good control of crown and root rot (caused by several different fungi) [including *Phytophthora peoniae*: *R.A.M.*, viii, p. 244] and Lemoine's disease [of undetermined origin].

PAPE (H.). **Falscher Mehltau an Mohn.** [Downy mildew of Poppy.]—*Gartenwelt*, xxxvii, pp. 289–290, 2 figs., 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 2, p. 32, 1934.]

When ornamental garden varieties of poppy are severely infected by *Peronospora arborescens* [*R.A.M.*, ix, p. 626; xiii, p. 31] they are frequently killed in the cotyledonary leaf stage. Older plants

are stunted, the pedicel being absent or twisted and swollen; collapse ensues on the infection of the stem base. Diseased flower buds fail to open, with the result that their capsules shrivel and the seeds do not germinate. Infection is perpetuated by unduly close planting as well as by the admixture of fragments from the diseased capsules with the seed. Hence it is essential to burn all infected material in the autumn. Copper-containing fungicides do not give adequate control.

McKenny Hughes (A. W.). **Aphides as vectors of 'breaking' in Tulips.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 112–119, 1 pl., 1934.

In this report of his continued investigation of the 'breaking' disease in tulips [*R.A.M.*, x, p. 599], the author distinguishes three types of infection which he terms 'full break' (previously described as 'white break'), 'self break' ('red break'), and 'clotted break', a condition manifested in dark purple or dark red shiny varieties which never show the ordinary bicoloured 'full break', but intensify the self colour in great splashes and patches [ibid., xiii, p. 308]. The results of experiments from 1930 to 1933 [details of which are given] lead him to conclude provisionally that two viruses (possibly identical with those isolated by McWhorter) [ibid., xiii, p. 292] are present in the ordinary 'full break', one of which is selectively transmissible by the aphids *Myzus persicae* and *Macrosiphum gei* to healthy tulips, in which it causes 'self break'. There was no evidence that the second virus was transmitted alone. 'Self break' tulips can only transmit 'self breaking'. It was definitely established that 'parroting' [ibid., x, p. 599] is not transmissible by the aphids, and it is believed to be probably rather a 'sport' than a virus infection. It was also found that *Anuraphis tulipae* is a definite vector of all three types of 'breaking' in the bulb store, but not on the growing plant, and that at a certain stage of growth tulips cease to be susceptible to infection.

McKay (M. B.) & Warner (M. F.). **Historical sketch of Tulip mosaic or breaking. The oldest known plant virus disease.** —*Nat. Hort. Mag.*, xii, 3, pp. 179–216, 14 figs., 1933. [Received May, 1934.]

After a brief reference to recent research work establishing that 'breaking' in tulips is a virus disease [see preceding abstract], the author gives a number of citations from earlier literature dealing with this condition, from which he concludes that the first definite record of 'breaking' in its aspect of variegation of the flowers was published in 1576 by Carolus Clusius. The fact that he based his observations on the collection of Rye of Mechlin, which was started from Turkish bulbs received about 1562, would indicate that the disease was introduced into western Europe from Turkey, where it was probably observed in 1555 or even earlier. The paper also contains some interesting early illustrations of broken varieties, and terminates with a bibliography, arranged chronologically, of the literature cited.

HAASIS (F. A.). **Control of the Narcissus leaf-scorch under Long Island conditions.**—Abs. in *Phytopath.*, xxiv, 1, pp. 9–10, 1934.

A considerable reduction in the number of primary leaf scorch (*Stagonospora curtisii*) infections on narcissus [*Narcissus* spp.] on Long Island [*R.A.M.*, xiii, p. 167] is obtained by one hour's immersion of the bulbs in water, followed by a 30-minute dip in mercuric chloride 1 in 750 or formaldehyde 1 in 120 before planting. Secondary infections may be controlled by timely applications (four or five between the first week in May and the third in June) of 4–4–50 Bordeaux mixture or 20–80 copper-lime dust.

LAUBERT (R.). **Beobachtungen und Fragen über die Biologie des Mahonienrostes.** [Observations and questions on the biology of the *Mahonia* rust.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv, (*Jahrbuch*), pp. 273–275, 1 fig., 1933.

Berberis aquifolium leaves in the writer's garden in a suburb of Berlin were observed, in June, 1933, to bear blood-red spots containing uredospores and a few teleutospores of *Puccinia mirabilissima* [*R.A.M.*, xii, p. 578]. A microscopic examination of the lesions and a comparative microscopic study of the aecidial stage with that of *P. graminis* precluded any possibility of confusion between the two rusts. The aecidia of *P. mirabilissima* evidently arise from sporidia formed during May by the teleutospores on overwintered leaves.

KEUR (J. Y.). **Studies of the occurrence and transmission of virus diseases in the genus Abutilon.**—*Bull. Torrey Bot. Club*, lxi, 2, pp. 53–70, 4 pl., 1934.

Some of the results obtained by the writer in his studies at the New York Botanical Garden (1928–32) on the occurrence and transmission of virus diseases in *Abutilon* have already been summarized from another source [*R.A.M.*, xiii, p. 381]. Definite evidence of the transmission of the virus through seeds was obtained. Of the 3,185 seedlings grown, involving all possible combinations of inter-clone pollinations, 461 showed 'variegated' characters. Four of the seedlings tested were capable of transmitting their variegation to *A. regnellii*; these seedlings arose from crosses between *A.* clone *mulleri* and *A.* [*striatum*] clone *thompsoni* [ibid., vii, p. 386; xi, p. 592] neither of which is self-compatible, so that the virus in these clones is transmissible to a small percentage of the offspring. No evidence of insect transmission was obtained.

Previous workers have claimed that the seeds obtained from variegated plants give rise exclusively to green seedlings [loc. cit.]. In the writer's tests this was the case with 969 seedlings grown from seed of *A. regnellii* plants rendered variegated by graft infection. The apparent absence of the virus in the seeds of this species and the low percentage of infected seedlings obtained from the plants mentioned above indicate that the variegation virus is not usually distributed to the embryo, at any rate in an active form.

Evidence of the existence of two types or strains of variegation [loc. cit.] was forthcoming, the form affecting *A. thompsoni*, *A.*

mulleri, *A. megapotamicum variegatum*, and the Eclipse variety being more intense than that occurring in infected garden stock of the New York Botanic Garden.

GRILLO (H. V. DA S.). **Sobre a Pestalotia rhipsalidis sp. n.** [On *Pestalotia rhipsalidis* sp. n.]—*Arq. Inst. Biol. Veg.*, i, 1, pp. 63–65, 3 figs., 1934.

Portuguese and Latin diagnoses are given of *Pestalotia* [*Pestalozzia*: cf. *R.A.M.*, viii, p. 605] *rhipsalidis*, found producing irregular, epiphyllous or amphigenous, vivid yellow, dark-edged lesions on living joints of the cactus *Rhipsalis pachyptera* in the Botanic Garden, Rio de Janeiro, Brazil. The black, punctiform, globose to lenticular acervuli embedded in the spots, later erumpent, measure 150 to 250 μ in diameter; the 4-septate conidia, straight or slightly curved, measure 22 to 27 by 9 to 11 μ, the intermediate olivaceous loculi 18 to 22 μ; the hyaline apical cell is cylindrical, generally 3-, rarely 2- or 4-ciliate, the divaricate cilia measuring 13 to 27 μ in length, while a hyaline, filiform pedicel, 7 to 11 μ long, remains on the lanceolate basal cell.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Two new diseases of the Texas Bluebell, Eustoma russellianum.**—Abs. in *Phytopath.*, xxiv, 1, p. 19, 1934.

During the last five years the Texas bluebell (*Eustoma russellianum*) has been affected by two diseases of commercial importance, namely, crown rot and damping-off caused by *Fusarium solani* [*R.A.M.*, xii, p. 135], and stem and leaf blight due to *Sclerophoma eustomonis* n. sp. Inoculation experiments with pure cultures of both fungi gave positive results. Insects from diseased plants were found to carry viable spores of both organisms. Soil sterilization with formaldehyde controlled the fusariosis, while the stem blight was combated by spraying with 4–4–50 Bordeaux mixture plus casein as a spreader and nicotine as an insecticide.

LEMESLE (R.). **Des divers effets produits par le Fusarium anthophilum (A. Br.) Wr. sur l'ovule de Scabiosa succisa.** [On the different effects produced by *Fusarium anthophilum* (A. Br.) Wr. on the ovule of *Scabiosa succisa*.]—*Comptes rendus Acad. des Sciences*, cxcviii, 1, pp. 117–118, 3 figs., 1934.

The fate of the ovules of *Scabiosa succisa* flowers attacked by *Fusarium anthophilum* [*R.A.M.*, xii, p. 292] was found to be very variable. In some cases the normal structure and fertility may be preserved, but more often the hyphae either penetrate the ovule and replace the constituents of the embryonal sac, or the latter simply remains undifferentiated as a cavity containing not a trace of mycelium. The stamens develop normally and the pollen sacs are well filled.

CUNNINGHAM (G. H.). **Orchard sprays in New Zealand. VII. Combination sprays.**—*New Zealand Journ. of Agric.*, xlviii, 1, pp. 1–12, 1934,

In these notes on combination sprays commercially used in New Zealand against pests and diseases of orchard trees [*R.A.M.*, xii,

p. 42] the author states that a spray consisting of 2 lb. colloidal sulphur in 100 galls. of 0·083 per cent. lime-sulphur gives satisfactory control (without scorching) of apple black spot [scab: *Venturia inaequalis*: ibid., xii, p. 296] and powdery mildew [*Podosphaera leucotricha*: ibid., xi, p. 604] as well as of leaf rust and brown rot of stone fruits [*Puccinia pruni-spinosae* and *Sclerotinia americana*, respectively: ibid., viii, p. 451; x, p. 317]. Lime-sulphur plus nicotine or nicotine sulphate (0·05 per cent. nicotine is the standard concentration recommended) is used against fungi and soft-bodied insects attacking pome fruit and stone fruit trees; soap, which reacts with the lime-sulphur to form insoluble calcium soap, should not be added. The addition of casein or lime-casein spreaders does not materially improve the excellent wetting and spreading qualities of lime-sulphur.

Bordeaux mixture plus lead arsenate provides a good stock spray against chewing insects and endoparasitic fungi attacking plants that tolerate summer applications of Bordeaux mixture; spreading and adhesiveness are, however, improved by the addition of a highly refined, unemulsified summer oil at a concentration of 0·25 per cent. Bordeaux or Burgundy mixture plus nicotine or nicotine sulphate and the same spreader is used against soft-bodied insects and fungi other than powdery mildews on plants tolerating Bordeaux mixture during the growing season.

Lime-sulphur plus lead arsenate plus colloidal sulphur is effective against ecto- and endo-parasitic fungi and chewing insects and as a standard summer spray against apple mildew.

CUNNINGHAM (G. H.). **Effects on Apple trees of lime-sulphur following Bordeaux mixture.**—*New Zealand Journ. of Agric.*, xlviii, 1, pp. 15–17, 1934.

Field tests in New Zealand indicated that contrary to the belief held by some growers applications [e.g., against *Venturia inaequalis*] of Bordeaux mixture or copper sulphate in combination with lime-sulphur in the spraying programme are not injurious to apple trees, provided that the lime-sulphur is not present in excess. Soluble copper compounds are not formed when Bordeaux mixture (3–4–50) is combined with 0·2 per cent. lime-sulphur, an approximately neutral compound being produced. No noticeable damage followed a pink or pre-pink application of 0·2 per cent. lime-sulphur to apple trees sprayed at the green-tip stage with Bordeaux mixture (5–4–50).

Injury is unlikely to result when apple trees are sprayed at the green-tip stage with Bordeaux mixture (5–4–50 or 3–4–50), followed at the pink or pre-pink stage with 0·2 per cent. lime-sulphur.

The varieties used in these experiments were Delicious, Jonathan, Sturmer, and Rome Beauty.

LOEWEL (E. L.). **Auswirkung der Kupferschäden zu den einzelnen Spritzzeiten.** [The operation of copper injuries at individual spraying dates.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 2, pp. 71–76, 1 fig., 1934.

The copper-containing fungicides (Bordeaux mixture, Wacker's [see above, p. 418] and Bayer's copper-lime, cuprosa, and nosperit)

used on apple trees in the Altenland district of Germany against scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xii, p. 297] caused no damage to healthy leaves when applied during the period of the bursting of the buds (between 10th and 20th April) at concentrations up to 2 per cent., while at 0·75 to 1 per cent. they may safely be given until the beginning of May. Only when the bud leaves show signs of having been injured by frost, insects, or carbolineum preparations containing too much phenol was there a certain amount of scorching or retarded growth as a result of copper spraying after the buds had opened. Even when applied during the blossoming period the copper fungicides at 0·5 per cent. caused only slight injury to the resulting fruit, especially when followed by lime-sulphur plus lead arsenate. From petal fall to about 15th June the risk of causing scorching of the fruit increases, to decline again from the end of the month onwards with the thickening of the cuticle.

MacDaniels (L. H.) & Burrell (A. B.). **The effect of sulphur fungicides, applied during the bloom, on the set of Apple fruits.**—*Phytopath.*, xxiv, 2, pp. 144–150, 1934.

This is an expanded and tabulated account of the writers' studies in New York, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 34], on the effect of lime-sulphur and sulphur dust, applied during the blossoming period against scab [*Venturia inaequalis*] and other diseases, on the set of apple fruits.

Hildebrand (E. M.). **The origin of roots stimulated by hairy-root bacteria in Apple stems.**—Abs. in *Phytopath.*, xxiv, 1, p. 11, 1934.

Some four weeks after the inoculation of nursery apple trees with *Pseudomonas* [*Bacterium*] *rhizogenes* [*R.A.M.*, xi, p. 561], hairy roots begin to be formed in the callus tissue elaborated by the host in response to the combined effects of wounding and the presence of bacteria. Wounding alone appears temporarily to stimulate the multiplication of the ray cells of the xylem and the cells of all the living tissues outside the woody cylinder except the epidermis. The re-establishment of cambial continuity, which normally checks this process, is largely prevented by the presence of the bacteria, with the result that further proliferation and root formation take place. The first and second weeks after inoculation are marked by cell multiplication over almost the entire wound, the 'islands' surrounding the necrotic groups (bacteria, crushed cells, and foreign matter) appearing as circular areas of hyperplasia. Late in the second week meristematic areas begin to develop in the elaborated tissues, whence the roots are subsequently produced independently of the deeper normal layers.

Burgert (Irma A.). **A study of some factors influencing germination of the spores of Phyllosticta solitaria.**—*Trans. Kansas Acad. Sci.*, xxxvi, p. 82, 1933.

The best germination of *Phyllosticta solitaria* spores in distilled water was obtained from cultures at least four weeks old, the minimum, optimum, and maximum temperatures for the process

being 5°, 21° to 23°, and 39° C., respectively [*R.A.M.*, xii, p. 701]. Spores from pycnidia in apple bark cankers showed consistently poorer germination than those from culture, but their temperature relations were identical. Germination was increased in bark decoction and diminished in apple fruit juice, as compared with distilled water. Bark tissue (especially of apple) placed near the germination drop acted as a stimulant, but spore growth was retarded by pieces of orange rind or fruit, onion scale or shoot, and apple fruit tissue. No appreciable influence was exerted by varying degrees of light. In culture the spores of *P. solitaria* begin to germinate almost immediately they are formed, but as the germination percentage increases subsequently there would seem to be an interval between the morphological and physiological maturity of the spores both in nature and in culture.

SHAW (L.). **Intercellular relative humidity in relation to fireblight resistance in Apple and Pear.**—Abs. in *Phytopath.*, xxiv, 1, p. 17, 1934.

Measurements were made of the growth of the apple and pear fireblight pathogen (*Bacillus amylovorus*) on various culture media at relative humidities of 99·9, 99, 98, 97, 96, and 95 per cent., corresponding approximately to osmotic pressures of 2, 12, 27, 41, 55, and 68 atmospheres, respectively. The maximum growth occurred at the highest relative humidity, with a drop to about $\frac{1}{2}$ at 99 and $\frac{1}{10}$ at 98, below which practically no development was made. A direct correlation was observed between increased resistance to fireblight and lowered relative humidity in the intercellular spaces of the tissues, 97 per cent. being associated with complete resistance to infection and 100 per cent. with maximum susceptibility.

WILSON (E. E.). **Bacterial canker of stone-fruit trees in California.**—*Hilgardia*, viii, 3, pp. 83–123, 8 figs., 1933. [Received May, 1934.]

Although bacterial gummosis of stone fruit trees usually differs from bacterial sour sap [*R.A.M.*, ix, p. 598] in the presence of abundant gum and better-defined, deeper cankers, no differences in the symptoms of the two conditions remain constant throughout the year. Isolations from the cankers of both types of disorder gave two groups of organisms, inoculations with either of which produced identical symptoms and both forms of canker on plum, peach, apricot, and cherry limbs. Parallel inoculations of President (*Prunus domestica*) and Wickson (Japanese plum, *P. salicina*) plum trees gave indefinite cankers without gum formation on the former and well-defined ones with abundant gum on the latter. It is evident that both conditions are manifestations of the same disease.

Both groups of bacteria were similar in size, in the number and arrangement of the flagella, in growth characteristics on various media, and in utilization of carbon and nitrogen compounds, and only slightly different in liquefaction of gelatine and reaction on milk. The most consistent difference was in intensity of pigment production, one (referred to as the 'green' group) producing a

lumière-green discoloration of most media, while the other, or 'white' group (found in 85 to 90 per cent. of the isolations), formed a lemon-yellow pigment in certain media only. The two groups are regarded as strains of the same species.

The identity of the white strain from both types of canker with *Pseudomonas prunicola* (received from Wormald) [ibid., xii, p. 455] was confirmed, and the green strain was identified as *P. cerasi* [ibid., xi, pp. 249, 311; xii, p. 227]. The white strain is therefore considered to be a variety of the earlier named species and is termed *P. cerasi* var. *prunicola* n. var., a technical description being given in English.

Inoculations of plum and cherry trees gave only small lesions in early autumn and late spring, but extensive cankers in late autumn and early spring. That the host itself may influence the progress of the disease was indicated by the fact that the small lesions were buried in new host tissue, while the others were not.

It is pointed out that the bacterial sour sap studied in California is not related to the similarly named condition attributed in the United States and other countries to physiological disturbances [ibid., iv, p. 20; ix, p. 288]. A bibliography of 33 titles is appended.

LAUBERT (R.). **Was jeder über die Plowrightia-Krankheit der Obstbäume wissen sollte.** [What everyone should know about the *Plowrightia* disease of fruit trees.]—*Die Kranke Pflanze*, xi, 1, pp. 3–5, 1 fig., 1934.

A popular note is given on the history, symptoms, etiology, and control of 'black knot' (*Dibotryon morbosum*) of plums, cherries, apricots, peaches, almonds, and other species of *Prunus*, hitherto reported only from North America [*R.A.M.*, x, p. 392]. The stringent plant protection regulations now in force should serve to exclude the black knot fungus from Germany, but in the event of its appearance the proper authorities must immediately be notified.

FITZPATRICK (R. E.). **The life-history and parasitism of Taphrina deformans.**—*Scient. Agric.*, xiv, 6, pp. 305–326, 2 pl., 6 figs., 4 graphs, 1934.

Studies [which are fully described] conducted in Ontario showed that peach infection by *Taphrina deformans* [*R.A.M.*, xii, p. 227] takes place in spring; in the Niagara district it seldom, if ever, occurs in summer. The ascospores and the sprout conidia derived from them persist through the summer and winter on the twigs and buds, where the conidia presumably multiply and from which they are washed on to the opening leaf buds by the spring rains. Penetration may occur from either leaf surface, the spore producing a short hypha which attaches itself to the leaf and through which the spore contents pass into the cuticle, where limited growth is made. Penetration then takes place between the epidermal cells, and for a time the fungus grows out in all directions in the intercellular spaces among the parenchyma cells. The mycelium is irregular, and at first very thin and without septa, but it thickens later on, numerous cross walls being laid down.

Only cells in actual contact with the mycelium become hypertrophied, which causes the diseased tissue to appear sharply delimited. Stomatal penetration as described by Martin [ibid., iv, p. 447] was never observed. There is no evidence that the fungus ever becomes perennial in the attacked twigs.

The nuclear cycle differs from that of *T. epiphylla* and *T. klebahni* [ibid., vi, p. 587] in that no copulation occurs before infection, the binucleate condition being brought about by the division of the haploid nucleus of the spore at the time of infection to give a pair of nuclei [cf. ibid., vi, p. 762]. When the spore contents pass into the host cuticle the two nuclei divide conjugately, giving rise to other pairs and so producing the binucleate mycelium. The nuclear situation in *T. deformans* is comparable to that of a short-cycle rust of the *Puccinia malvacearum* type, in which the diploid phase is initiated directly from a monobasidiospore infection. The nuclear situation in *T. epiphylla* and *Ustilago violacea* is essentially the same as that of a long-cycled rust of the *P. graminis* type, two haploid spores of opposite potentiality being necessary for the completion of the life-cycle. If *P. malvacearum* is, as has been suggested [ibid., x, p. 556], a reduced form from the long-cycled type of rust, the same process of evolution which is occurring in the rusts may be taking place in the genus *Taphrina*, so that *T. deformans* may be a short-cycled form evolved from the long-cycled *T. epiphylla* type and in which hybridity has been lost and each haplont becomes self-fertile.

TRIFONOVA (VERA). **Die Rotfleckenkrankheit der Pflaume Polystigma rubrum (Pers.) D.C.** [The red spot disease of the Plum, *Polystigma rubrum* (Pers.) D.C.]—*Phytopath. Zeitschr.*, vii, 1, pp. 73–92, 6 figs., 1934.

The red spot disease of plums (*Polystigma rubrum*) is stated to be responsible for very heavy damage in Bulgaria (where the present studies were conducted), Serbia [*R.A.M.*, xi, 660], and Russia, the indigenous Küstendil damson being particularly liable to infection.

The fungus restricts its attacks to the foliage, on which it forms circular, elliptical, or irregular blood-red spots, later turning blackish, averaging 6 to 7 mm. in diameter, somewhat sunken on the upper and correspondingly raised on the under side, where the dark red ostioles of the pycnidia are visible. The morphology of *P. rubrum* is fully described. The fungus is an obligate parasite and all attempts to grow it on artificial media gave negative results. Inoculation experiments on young damson leaves with an aqueous suspension of the ascospores of *P. rubrum* were successful, whereas it was impossible to induce the typical symptoms of the disease with pycnospores. It is suggested that the fungus is heterothallic and that monospore infections with the ascospores in the spring produce spots composed exclusively of unisexual pycnidia. At the end of the summer the archicarps with trichogynes formed in the spots would also be of different sexes. At the same time in rainy weather the pycnospores would be exuded and reach the trichogynes, the + pycnospores penetrating the – trichogynes and conversely. From this fusion arise the perithecia and in the spring

the separation of the sexes recommences with ascospore formation. The emergence of the trichogyne, to which numerous pycnospores nearly always adhere, was frequently observed in the writer's histological studies, but owing to the impossibility of obtaining pure cultures of *P. rubrum*, the foregoing hypothesis regarding pycnospore function could not be definitely substantiated.

Good control of red spot was obtained by three applications of 1 per cent. Bordeaux mixture or solbar and 1 in 40 lime-sulphur between the end of April and beginning of June, the critical period for mass infections. In damp seasons *P. rubrum* is also liable to destruction on an extensive scale by *Gloeosporium polystigmicolum*, which may considerably reduce the ravages of the plum parasite in the following year.

The 'degeneration' of the Strawberry.—*Imper. Bureau of Fruit Production Tech. Communication* 5, 28 pp., 34.

This survey of recent researches conducted in numerous countries into strawberry degeneration consists of four distinct contributions by D. Akenhead, R. V. Harris, G. H. Berkeley, and A. M. Massee dealing, respectively, with the pomological, virus, root rot, and entomological aspects of the problem. In the second paper yellow edge [*R.A.M.*, xii, p. 519], crinkle [ibid., xiii, p. 110], and gold disease [ibid., xiii, p. 41] are briefly discussed; the third includes root rots associated with *Rhizoctonia* [ibid., xi, pp. 380, 661; xii, pp. 489, 680], *Leptosphaeria coniothyrium* [ibid., xi, p. 252], and several other fungi, mention being also made of the red core disease associated with a species of *Phytophthora* [ibid., ix, p. 795] and of *Verticillium* wilt [ibid., xii, p. 139]. Each section has a comprehensive bibliography.

PLAKIDAS (A. G.). **Rosette of Blackberries and Dewberries.**—Abs. in *Phytopath.*, xxiv, 1, pp. 15–16, 1934.

'Double blossom' or rosette, the most serious disease of blackberries and dewberries in Louisiana, is generally attributed to *Fusisporium rubi* [*R.A.M.*, xi, p. 727], but the writer's investigations point to a species of *Cercosporella* as the agent. Inoculations with pure cultures of the latter consistently gave rise to the disease. Natural infection takes place on the primary canes in the spring, but the appearance of the symptoms is delayed until a year later when growth is resumed. At this juncture the infected buds produce witches' brooms and abnormal blossoms setting no fruit. The infection period ranges from about the middle of March, when the spores begin to appear on the diseased flowers, to the middle of June. Practically complete control may be obtained by the application to the primary canes of 4–4–50 Bordeaux mixture every ten days from 1st April to 1st June.

WARDLAW (C. W.). **Banana diseases. VI. The nature and occurrence of pitting disease and fruit spots. VII. Notes on Banana leaf diseases in Trinidad.**—*Trop. Agriculture*, xi, 1, pp. 8–15, 4 pl., 1934.

In the first of these two papers details are given of the author's investigation of the occurrence in Trinidad of the banana pitting

disease (*Piricularia grisea*), first recorded there in 1933 [*R.A.M.*, xiii, p. 252]. So far it has been found to be mainly restricted to the Giant Governor and Governor [varieties of *Musa cavendishii*], only occasional bunches showing sufficiently severe infections to cause serious finger dropping. On the Gros Michel the disease was found to occur in a very mild form, the minute pits or spots becoming perceptible only on yellow fruit approaching final maturity. Although incomplete, the data suggested a direct relationship between the outbreak of the disease and the abnormally prolonged and continuous rainy period which prevailed in Trinidad during the 1932–3 season, and supported the contention that infections on the bunches are of field origin but remain dormant until the fruit has been in storage for some time. The possibility of controlling the disease under various weather conditions is briefly discussed.

In a brief outline of the literature on banana fruit spots the author refers to Petri's [ibid., xi, p. 765] and Deighton's [ibid., xii, p. 201] papers, in which the spots were attributed to the activity of various fungi, and to recent communications from Johnston, and Johnston and Slocum (*Res. Dept. United Fruit Co. Bulls.* 41 and 43, Boston, Mass., 1932) who described under the name 'the fruit spot' a disease on Gros Michel bananas in Jamaica and Central and South America, which they attribute to physiological causes. In Trinidad investigations indicated that the fruit spots are of fungal origin; besides *P. grisea*, other fungi such as *Helminthosporium torulosum* and *Gloeosporium musarum* have been isolated, but the preponderance of the first-named in early isolations and its slow growth rate as compared with the others indicate that it is the chief cause of the pitting disease, with *H. torulosum* and *G. musarum* as primary causes of other types of spots on the fruit, not always distinguishable macroscopically from pitting. As a general rule, the spots are of scanty occurrence and economically unimportant in Trinidad, although severe spotting may be occasionally observed in the Cavendish variety. Information from Brazil indicates that the removal of the bracts previously recommended [ibid., xi, p. 728] has not been effective in areas of high rainfall in the control of pitting.

In the second paper brief notes are given on the different banana leaf spots that occur in Trinidad, namely, black spots of the type described by Ashby from Jamaica, from which isolations consistently yielded *H. torulosum*, sometimes associated with *Pestalozzia leprogena*, *Nigrospora oryzae*, *Acrothecium lunatum* [*Curvularia lunata*: see below, p. 475], and *Fusarium semitectum* [ibid., xiii, p. 128]. Lenticular, pale brown spots with a dark periphery and yellow margin, and marginal wedge-shaped infections yielded a mixed fungal flora [a list of which is given], among which *Cordana musae* (*Scolecotrichum musae*) [ibid., vi, p. 144; xii, p. 458] was the most common and conspicuous, all the evidence available indicating that this fungus is the active parasite in such spots. An enumeration is also given of the fungi (regarded as weak parasites) which have been isolated from spots on debilitated banana plants and also of those obtained from a characteristic leaf mottling or speckling with minute, brown specks, which is stated to be of very frequent occurrence in some parts of Trinidad.

WARDLAW (C. W.). **Preliminary observations on the storage of Avocado Pears.**—*Trop. Agriculture*, xi, 2, pp. 27–35, 2 pl., 1 fig., 4 graphs, 1934.

In preliminary storage trials [which are described and the results of which are tabulated and expressed graphically] with West Indian avocado pears conducted at the Low Temperature Station, Trinidad, fungal wastage in fruit stored at tropical temperatures was largely due to anthracnose (*Colletotrichum gloeosporioides*) [*R.A.M.*, viii, p. 727], while in cold storage much of the loss, consisting of stem-end rot, spreading spots, blemishes, and soft rots, was caused by *Botryodiplodia theobromae* [ibid., xii, p. 707], in association with which *Fusarium* and *Phomopsis* spp. were occasionally isolated: wounded areas became infected by *Penicillium expansum*.

On the whole, purple varieties were less affected by storage diseases than green ones, some of the latter being very liable to attack by anthracnose and soft rots. Fruit held at 40° and 45° F. and ripened up to 75° in the course of five to seven days suffered very little from fungal invasion, the main cause of rejection being internal discoloration due to chilling. The tests showed that of the 33 varieties used, 22 were apparently not sufficiently cold-resistant to stand a temperature of 40° to 53° F. for 15 to 20 days without developing a characteristic brown discoloration resembling internal breakdown.

Amtliche Kontrolle von Pflanzenschutzmitteln. [The official supervision of plant protectives.]—*Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 1, p. 9, 1934.

A list is given of certain plant protectives of established efficacy that have been placed by their respective manufacturers under the permanent supervision of the Vienna Plant Protection Institute. Guarantees respecting the composition of the preparations are supplied by the firms and their validity verified by the examination of samples from the factory or agency, or on farms, vineyards, and other establishments in which the products are used.

Les pulvérisateurs. [Sprayers.]—Publ. of *Direct. Gén. Agric., Comm. et Colon.* [Morocco], *Service Défense Végét.*, 7 (2nd edit.), 101 pp., 64 figs., 1934.

This pamphlet consists of a series of papers giving technical details of the construction and working of a large number of types of sprayers now used in the control of parasitic diseases and insect pests of cultivated crops, and is meant to assist the practical grower in the choice of the spraying apparatus best suited for his purposes.

ATANASOFF (D.). Болести на културнитѣ растения. [Diseases of cultivated plants.]—xv + 622 pp., 221 figs., Университетска Библиотека [University Library] 137, Imprimerie de la Cour, Sofia, 1934.

This text-book, designed for the usage of practical agriculturists and growers, gives an account in semi-popular language of the more important physiological and nutritional troubles, and of

virus, bacterial, and fungal diseases of cultivated useful and ornamental plants in Bulgaria. The morphology and biology of the causal organisms are very briefly indicated, while the symptoms are more fully described. The relative economic significance of the diseases and the measures for their control are discussed in some detail in each case, the relevant bibliography being appended to the account of each disease. The book is well illustrated, some of the figures being original, and terminates with an index of the Latin names of the hosts and parasites.

CLINTON (G. P.). **Plant pest handbook for Connecticut. II. Diseases and injuries.**—*Connecticut Agric. Exper. Stat. Bull.* 358, pp. 151–329 + xi–xxvi, 55 figs., 1934.

This very useful publication, destined for the use of practical agriculturists and growers, gives a brief account of the symptoms of all the fungal, bacterial, and virus diseases, and of all the physiological and other troubles caused by environmental influences, which have been observed by the author on cultivated economic and ornamental plants in Connecticut. They are listed in the alphabetical order of the common names of the hosts. In some cases control measures are indicated, and in an addendum notes are given on work done by the author on certain of the diseases or injuries, as well as on a few that are of special importance because of recent outbreaks in the State. The book terminates with a full Latin index of the parasitic and saprophytic bacteria and fungi dealt with, with the hosts on which they were found.

Projet d'enquête sur la dispersion géographique des champignons parasites des végétaux en Europe et constitution d'un herbier cryptogamique. [Proposed inquiry into the geographical distribution of fungal parasites of plants in Europe and formation of a cryptogamic herbarium.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9–10, p. 313, 1933. [Received May, 1934.]

In pursuance of an earlier proposal, the execution of which was delayed by the war, of forming a cryptogamic herbarium and assembling information on the present geographical distribution in Europe of the fungal parasites of plants, the Société de pathologie végétale et d'entomologie agricole de France invites the cooperation of members in forwarding specimens (which, after examination and classification, will form the subject of notes in the *Revue* of the Society) to the Secrétariat Général at 16, rue Claude Bernard, Paris. Envelopes should be marked 'Herbier Cryptogamique'.

FAJARDO (T. J.). **Plant-disease problems confronting truck farmers in Trinidad Valley and the vicinity of Baguio, Mountain Province, Philippine Islands.**—*Philipp. Journ. of Sci.*, lviii, 1, pp. 67–95, 25 pl., 1934.

Notes are given in semi-popular terms on the most important and common diseases of vegetable and other crops, chiefly of the Cruciferae, Cucurbitaceae, Leguminosae, Solanaceae, and Umbelliferae, in Mountain Province, Philippine Islands. The paper is

illustrated by excellent photographs and some brief recommendations for control are given.

DOAK (K. D.). **Fungi that produce ectotrophic mycorrhizae of conifers.**—Abs. in *Phytopath.*, xxiv, 1, p. 7, 1934.

The following combinations of fungi and conifer seedlings yielded typical ectotrophic mycorrhiza in pure culture [*R.A.M.*, xii, p. 778]: *Boletus bicolor* with *Pinus rigida*; *B. granulatus* with *P. strobus* and *P. taeda*; *B. eximus* with *P. taeda*; *B. brevipes* with *P. rigida* and *P. taeda*; *B. chromapes* with *P. taeda*; *Boletinus pictis* with *P. strobus*, *P. taeda*, *P. resinosa*, and *P. rigida*; *Cantharellus ciborius* and *Amanita muscaria* with *P. taeda* and *P. strobus*; *Russula lepida* with *P. rigida*, *P. taeda*, and *P. strobus*; and *Scleroderma vulgare* with *P. strobus*. The characteristic mantle and Hartig network were histologically demonstrated in each case. The fungi grew well in sand cultures with sterile seedlings, supplemented by a mineral nutrient solution with 0·5 per cent. dextrose, successful reisolations being made in the majority of cases.

HATCH (A. B.). **Preliminary note on the relation of mycorrhizae to dry-weight increase in Pinus strobus.**—Abs. in *Phytopath.*, xxiv, 1, p. 10, 1934.

From a statistical calculation of the dry weights of *Pinus strobus* seedlings grown in pot cultures with mycorrhizal fungi [see preceding abstract] it was inferred that the latter are not detrimental to the growth of the plants. A similar assumption with regard to the potential benefits of the mycorrhizal association is not, however, justifiable on account of the possible masking of such effect. Mycotrophism in *P. strobus* is apparently induced by low internal nutrient concentrations, so that the initial development of mycorrhiza is correlated with this factor. The beneficial theory postulates superior absorptive efficiency for mycorrhiza, hence seedlings varying in nutrient reserves at germination should tend towards uniformity on exposure to mycorrhizal inocula. This may apparently occur, since seedlings grown in soil cultures have lower variation coefficients than sand culture seedlings, from which such inocula are absent.

HANSEN (H. P.). **Inheritance of resistance to plant diseases caused by fungi, bacteria and vira. A collective review with a bibliography.**—Reprinted from *Yearbook Roy. Veter. & Agric. Coll. Copenhagen, 1934*, 74 pp., 1934.

In a brief introduction this paper is stated to be an attempt to bring together and to correlate the results, described in the relevant literature up to the end of 1932, of genetical investigations of the inheritance of resistance to fungal, bacterial, and virus diseases in hybrids of economically important plants belonging to 18 natural orders. The cytological and genetical conditions of most of the hybrids (with the exception of the *Oenothera* crosses [*R.A.M.*, ii, p. 74], which are dealt with separately) are referred to three main groups, namely, entirely fertile hybrids, resulting from intervarietal and interspecific crosses; partly fertile hybrids, resulting from interspecific crosses; and partly sterile and fertile hybrids, result-

ing from interspecific and intergeneric crosses, and the results of the investigations reviewed are discussed in some detail under each of these groups. A section is given to linkages between resistance and other host characters and another to resistance in chimaeras. The literature dealt with is arranged first in the alphabetical order of the Latin names of the hosts, and secondly in the alphabetical order of the authors' names, and comprises over 250 titles.

DE PHILIPPIS (A.). **Alcune ricerche di fitoimmunità.** [Researches on phyto-immunity.]—*Ann. R. Ist. Sup. Agrar. e Forest., Firenze*, Ser. II, iv, *1931–1933*, pp. 117–135, 3 figs., 1934.

In studies of plant immunity [*R.A.M.*, xiii, p. 159], examination of the anatomical and morphological characters and analysis of the juice of two varieties of celery, one resistant and the other susceptible to *Septoria petroselini* var. *apii* [*S. apii*: ibid., xii, p. 743], indicated that the resistance shown by the one variety was probably dynamic and due to a difference in capacity to react to the attack between the two varieties.

Attempts to immunize bean (*Phaseolus vulgaris*), *Ricinus*, pea, and celery against *Botrytis cinerea*, *Sclerotinia fuckeliana*, *Fusarium* sp., and *S. apii*, respectively, by watering the seedlings with the culture liquid prior to inoculation, gave negative results, though some degree of immunization resulted when the same liquid much diluted was injected into the seedlings; injections with strong solutions of the culture liquid killed the plants. From a comparison of the results obtained from the watering and the injections the author concludes that the watered plants cannot have absorbed any considerable amount of the excretory products of the fungi through the roots.

The resistance of *P. vulgaris* seedlings to *B. cinerea* was markedly increased by the addition to the sand in which they were growing of solutions of zinc sulphate, magnesium sulphate (each 0·05 per cent.), or lithium carbonate 0·03 per cent. in Knop's nutrient solution.

REID (R. D.). **Some observations on the ability of a mold, or its metabolic products, to inhibit bacterial growth.**—*Journ. of Bact.*, xxvi, 1, p. 28, 1934.

A species of *Penicillium* closely allied to *P. notatum* [*R.A.M.*, xii, p. 387] was found to be capable of inhibiting the growth of certain bacteria in the same culture dish [cf. ibid., xii, p. 109], a similar action being also exerted by the filtrate of synthetic or infusion cultures of the organism after passage through a Berkefeld filter. The inhibitory substance was shown to be closely connected with a pigment developing simultaneously; it is comparatively thermostable, volatile under certain conditions, and contains amylase and catalase. Coincident with the production of the inhibitory substance are an increase in the hydrogen-ion concentration and a reduction in the surface tension of the broth medium. Activated charcoal adsorbs the inhibitory material, which was found, however, to be inseparable from the filtrate by dialysis, distillation at low temperatures, and precipitation with

salts. Its formation was prevented by the action of light and certain gases during the incubation period.

WILCOXON (F.) & McCALLAN (S. E. A.). **The stimulation of fungus spore germination by aqueous plant extracts.**—Abs. in *Phytopath.*, xxiv, 1, p. 20, 1934.

The addition to distilled water of small quantities of tomato, orange, apple, or pear juice and aqueous extract of lily or gladiolus bulbs and dahlia or potato tubers induced nearly 100 per cent. germination in certain conidia that germinated poorly (*Pestalozzia stellata, Glomerella cingulata, Botrytis paeoniae,* and *Sclerotinia americana*) [*R.A.M.*, xii, pp. 107, 109] or not at all (*Penicillium* sp. and *Neurospora sitophila* [ibid., xiii, p. 7]) in the absence of a stimulant. Yeast extract and urine produced a similar effect, standard nutrient solutions being greatly inferior in this respect. About 0·05 per cent. of solids from tomato juice or yeast extract in the conidial suspension will give rise to nearly 100 per cent. germination in *P.* sp. and *N. sitophila*. The stimulatory factor is thermostable and dialysable.

VOLONSKY (M.). **Sur la nutrition de quelques champignons saprophytes et parasites.** [On the nutrition of some saprophytic and parasitic fungi.]—*Ann. Inst. Pasteur*, lii, 1, pp. 76–101, 1934.

A detailed account is given of the writer's experimental observations on the nutritional relations in pure culture of a number of saprophytic and parasitic fungi, the latter including *Pythium de Baryanum, Phytophthora parasitica, P. palmivora, P. cactorum, Ustilago maydis* [*U. zeae*], and various dermatophytes and entomophytes.

YARWOOD (C. E.). **The diurnal cycle of Erysiphe polygoni.**—Abs. in *Phytopath.*, xxiv, 1, pp. 20–21, 1934.

The generative cell of the conidiophore of *Erysiphe polygoni* on red clover [*Trifolium pratense*: *R.A.M.*, xii, pp. 207, 615] was found in field and greenhouse observations in Wisconsin to divide during the day, and the distal of the two daughter cells developed within two days into the mature conidium. Each conidiophore usually matures a single conidium daily, liberation occurring normally about noon, about which time and somewhat later spores taken from mildewed plants show a much higher germinative capacity than those removed in the early morning or late evening. Daytime inoculations result in a higher percentage of infection than those made at night. In continuous artificial light the diurnal cycle is no longer apparent, and it is less marked in cloudy weather. In alternating artificial light and darkness, with fairly constant temperature and humidity, the diurnal cycle approximates to that observed under natural conditions. *E. polygoni* on *Delphinium* spp. [ibid., viii, p. 108] in the greenhouse showed a similar diurnal cycle in respect of conidial formation and germinability.

DRAYTON (F. L.). **The sexual mechanism of Sclerotinia gladioli.** —*Mycologia*, xxvi, 1, pp. 46–72, 3 pl., 2 figs., 1 diag., 1 graph, 1934.

Efforts to obtain a sexually formed fruiting body from the minute sclerotia of *Sclerotinia gladioli* n. sp. [the name proposed by the author for the fungus previously known in its sterile stage as *Sclerotium gladioli*, of which a technical description is in the press: *R.A.M.*, xi, p. 666] proved unsuccessful, but similar experiments with stromatic tissue led to the detection of receptive structures which, when spermatized with microconidia from certain other thalli, gave rise to typical apothecia. Monomycelial cultures develop both receptive bodies and microconidia, and a crossing experiment with ten isolates from crocus, gladiolus, and freesia showed that these could be divided on a compatibility basis into two groups, the compatibility factor segregating, in back-crosses between the receptive bodies of single ascospore cultures and microconidia from each of the parent isolates, in a ratio of 1 : 1.

The globose, hyaline microconidia of the fungus, measuring 1·2 to 1·8 μ in diameter, developed satisfactorily at room temperature in two to three weeks on a medium of potato-dextrose agar and *Lycium halimifolium* stems. The optimum temperature for the production of the receptive bodies on a wheat grain and water medium ranged from 18° to 24° C. These bodies measure 0·8 to 1·9 mm. in height and 0·4 to 0·8 mm. in width, and are columnar, sometimes branched or cockscomb-shaped, tapering to a rounded apex or occasionally slightly capitate, light brown, pilose, and surrounded by a thin mucilaginous layer. Neither the apothecia, receptive bodies, nor microconidia of *S. gladioli* have been observed in nature, but there is reason to believe that the last-named organs are formed in the soil near diseased plants, while the others probably arise from the stromata in badly infected corms. The phenomenon exhibited by the sexual mechanism of *S. gladioli* is not regarded as an example of heterothallism in Blakeslee's sense (*Proc. Amer. Acad.*, xl, p. 205, 1904), there being no segregation of the sexes in separate thalli, but rather a homothallic condition in which each thallus is self-sterile and fertility the result of fusion exclusively between certain compatible thalli.

KÖHLER (E.). **Beiträge zum Studium des Kartoffelabbaus. Beobachtungen auf dem Dahlemer Versuchsfelde der Biologischen Reichsanstalt.** [Contributions to the study of Potato degeneration. Observations on the Dahlem experimental field of the National Biological Institute.]—*Landw. Jahrb.*, lxxix, 2, pp. 205–217, 1 graph, 1934.

Aphids (*Myzus persicae*), which are stated to be very prevalent on the peach trees in the gardens surrounding the Dahlem experimental field, transmitted leaf roll from diseased to healthy Paul Krüger [President] potatoes to the extent of 100 per cent. in the writer's recent experiments [cf. *R.A.M.*, xiii, p. 49]. The primary symptoms of the disease were also observed on Wohltmann, Odenwälder Blaue, and Erdgold plants in the experimental field. The progeny of Klein-Spiegeler Wohltmann tubers suffering

from mixed infections by the mild mosaic or semi-latent X (ring) virus, and Y mosaic [see next abstract], planted out in 1932, gave a greatly reduced yield in 1933, the after-effects of the disease being most conspicuous in the lots from Halle and Leipzig and least in those from Freising and Königsberg, which showed relatively slight infection in the beginning.

KÖHLER (E.). **Untersuchungen über die Viruskrankheiten der Kartoffel. III. Weitere Versuche mit Viren aus der Mosaikgruppe.** [Investigations on the virus diseases of the Potato. III. Further experiments with viruses of the mosaic group.] —*Phytopath. Zeitschr.*, vii, 1, pp. 1–30, 17 figs., 1934.

A comprehensive, fully tabulated account is given of the writer's further studies at Dahlem, Berlin, on the potato mosaic viruses M 23, H 19, R 77, and G.A. [*R.A.M.*, xii, pp. 586, 587], from which it appeared that R 77 is a mixture of an M 23 or X-like virus (R) and a heavily diluted Y virus (Yr) [ibid., xiii, pp. 258, 319]. On the other hand, M 23, H 19, and G.A. were found to be pure. Two further viruses of the M 23 type were isolated by inoculation from potato on to Samson tobacco, namely, Wo 8 from the Wohltmann variety and E 1 from Erdgold. All the closely related viruses of this group are characterized by a tendency to produce chlorotic, often necrotic rings on tobacco leaves and may hence be collectively styled 'ring viruses' [cf. preceding abstract]. Combined with G.A. each of the ring viruses produces the same acute symptoms on tobacco. Neither in potato nor tobacco could those organs already permeated by one ring virus be infected by rubbing with another of the same group, indicating that the various members of the latter make similar demands, corresponding to their constitutional affinities, on the nutrients afforded by the substratum [cf. ibid., xii, p. 581]. Mixed infections by several ring viruses may, however, occur either spontaneously or as a result of inoculation with blends of the different juices, the resultant symptoms in such cases presenting transitional stages between the pure components [cf. ibid., xiii, p. 61].

Opposed to the ring viruses are those of the Y group, characterized by similar thermal relationships among themselves, incapacity to infect *Datura stramonium*, the production on tobacco leaves of more or less marked vein clearing [see next abstract], and the intensification of the symptoms induced on tobacco by a ring virus where combined with the latter. The previous inoculation of a tobacco plant with a weak Y virus does not preclude its subsequent infection by a strong one of the same type, the latter in fact completely suppressing and possibly even assimilating the former. Plant organs already infected by a ring virus may be just as readily attacked by one of the Y group as entirely healthy material and conversely, since the requirements of the two groups are quite different. In mixed infections by ring and Y viruses the degree of virulence of the latter determines the severity of the disease. Tobacco leaves inoculated by rubbing with a ring virus after previous infection by a strong Y virus first develop sunken, slate-grey, rapidly expanding spots and eventually die. This

phenomenon does not occur when the plants are first inoculated with a ring virus and then with one of the Y group.

The ring viruses M 23, H 19, and R were found to be transmissible by rubbing from tobacco to the Erdgold and Klein-Spiegeler Wohltmann potato varieties. The two originally isolated from Wohltmann, M 23 and H 19, remained unchanged on reisolation after transfer from Wohltmann to tobacco, whereas R, originating in a selection, underwent considerable and permanent weakening—so much so, in fact, that it has as good a claim as the other ring viruses to be regarded as independent. Further proof is thus afforded of K. M. Smith's contention that the several ring viruses are permanent variations of one and the same basic virus ('X type viruses') [ibid., xii, p. 648]. The G.A. (strong Y) virus infected Kl.–Sp. Wohltmann and underwent no loss of virulence on reinoculation into tobacco. Erdgold, however, has not so far reacted positively to inoculation with this virus. The weak Y component comprised in the R 77 virus was unable to infect either Kl.–Sp. Wohltmann or Erdgold.

Tobacco plants developing acute symptoms as a sequel to inoculation with a virulent virus blend (ring + strong Y) later recover almost entirely, although both virus components are present in high concentrations in the infected parts. This tolerance, however, is not transmitted to the seeds arising from such plants, which produce seedlings showing no more resistance to virus infection than those from healthy individuals.

Two Erdgold plants were found to harbour two different latent viruses, E 8 [ibid., xiii, p. 119] and E 9, both of which were transmissible to tobacco, remaining latent on the latter host also. Combined with a ring virus they produce conspicuous curl-mosaic on Erdgold and a typical blend of symptoms on tobacco. A peculiar dark mosaic on an Erdgold plant may possibly (on the basis of analogous experiences) be attributed to a combination of a virus (? E 8) latent on tobacco with one that is transmissible neither to tobacco, potato, nor *D. stramonium*. A similar dark mosaic was once observed on a Paul Krüger [President] plant.

JONES (L. K.), ANDERSON (E. J.), & BURNETT (G.). **The latent virus of Potatoes.**—*Phytopath. Zeitschr.*, vii, 1, pp. 93–115, 3 figs., 1934.

The authors consider that the latent or 'healthy potato' virus commonly found in American potatoes appears to be the same as the X virus of English workers, while the veinbanding virus often associated with it corresponds to the Y virus in England [see preceding abstracts].

Tests [the results of which are fully discussed and tabulated] on John Baer tomatoes and Connecticut Havana tobacco plants as indicators at the Washington (State) Agricultural Experiment Station in 1931–2 showed that the latent virus was present, usually in a mild form, in 1,079 apparently healthy potato plants of several standard varieties, as well as in 188 affected by different virus diseases. From 4·5 per cent. of the seemingly healthy plants the latent virus produced virulent, necrotic symptoms on tobacco, while six such plants carried a virus causing a disorder on tobacco similar

to that resulting from inoculation with rugose mosaic of the potato. Potato plants showing symptoms of the latter disease usually harboured a virus capable of inducing spot necrosis on tobacco [*R.A.M.*, xii, pp. 108, 398, 580]. Three out of the 55 thus affected, however, produced only latent mottle symptoms on the transference of the plant juice to tobacco. In five tests with material from crinkle mosaic potatoes the inoculated tobacco plants developed spot necrosis, indicating that the former disturbance is merely an attenuated form of rugose mosaic.

By successive passage through tobacco plants the expression of the latent virus became intensified to a degree of virulence capable, either alone or in combination with the veinbanding virus, of inducing rugose mosaic on healthy Early Rose potatoes. Previous workers [reference to whose studies has been made in this *Review*] have shown that eleven Solanaceae are susceptible to systemic infection by the latent virus. Among these the latent virus was transferred in both its mottle and virulent form by the writers to *Nicandra physaloides*, *Datura stramonium*, and *Solanum nigrum*, and in addition to *Amaranthus retroflexus*. Three weeks after inoculation the affected plants were used as a source of infection for tomato and tobacco, on which the resulting symptoms were identical with those caused by the original latent virus. On the younger foliage of the four above-mentioned Solanaceae yellowing and mottling were constant features, accompanied by considerable necrosis in the case of the virulent form. Evidence was further obtained that the virulence of the latent virus may be even more rapidly increased by successive transfers through *N. physaloides* than by passage through tobacco.

These and other studies not yet reported lead the authors to conclude that both the latent and the veinbanding viruses are capable of such extensive modifications as to be able of themselves and without the addition of any other virus entity to cause a whole range of potato diseases, including rugose mosaic (crinkle A), crinkle mosaic, mild mosaic, and the various forms of streak. These modifications remain stable in a given host plant. The Z virus [ibid., xi, pp. 738, 741], in this view, would probably be an attenuated form of the Y virus.

SCHULTZ (E. S.), CLARK (C. F.), BONDE (R.), RALEIGH (W. P.), & STEVENSON (F. J.). **Resistance of Potato to mosaic and other virus diseases.**—*Phytopath.*, xxiv, 2, pp. 116–132, 1934.

None of the potato varieties, Green Mountain, Irish Cobbler, or Spaulding No. 4, or 33 seedlings representing 18 crosses, showed conclusive signs of resistance to leaf roll or spindle tuber in experiments carried out from 1924–32 for the most part in Presque Isle, Maine.

Spaulding No. 4 contracted a milder form of streak (stipple streak or acropetal necrosis) [*R.A.M.*, x, p. 746] than Green Mountain. Three types of reaction to this virus were observed among the different varieties, namely, (1) latent or masked, (2) mild foliar necrosis, and (3) severe dwarfing, curling, and necrosis of the tops, which usually die before tuber formation.

Seedling 41956 was found to be highly resistant to latent mosaic

[ibid., xii, p. 388; xiii, p. 320, and preceding abstracts]. The term latent mosaic is used by the writers to designate, not a single virus but several, one or other of which is present in every commercial variety tested; amongst these is the seedling streak present in Green Mountain which corresponds with Quanjer's acronecrosis or top necrosis. In field tests Katahdin (S. 42667) was also resistant to this disease, to which it succumbed, however, in tuber-graft experiments, contracting top necrosis.

Four types of reaction to mild mosaic [ibid., xiii, p. 257] may be differentiated, viz., (1) highly resistant, (2) seedlings rarely developing the disease in the field but liable to infection in tuber grafts, (3) seedlings manifesting milder symptoms than Green Mountain, and (4) those equalling the latter in susceptibility and clearness of symptom expression. The progeny of a cross between two resistant seedlings showed transgressive inheritance of mild mosaic, some being more resistant and others more susceptible than either of the parents. Two or more genetic factors, cumulative in effect, appear to be involved in the transmission of this resistance from parents to offspring. The Katahdin variety combines resistance to mild mosaic with other desirable economic characters.

Observations on the reaction of potatoes to latent and mild mosaic have shown that varieties readily succumbing to artificial inoculation seldom develop the diseases in the field, the performance of a given variety in which, therefore, is not necessarily indicated by its reaction to inoculation tests.

WHITEHEAD (T.). **The physiology of Potato leaf-roll. I. On the respiration of healthy and leaf-roll infected Potatoes.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 48–77, 2 figs., 18 graphs, 1934.

This is the full report of the author's investigation of the respiration of healthy and of leaf-roll potatoes, a preliminary account of which has already been noticed [*R.A.M.*, xi, p. 319]. In addition to the information previously given, it is stated that the work gave no evidence that the presence of the virus in the diseased plants had any direct influence on the rate of respiration, but only in so far as it affected the amount of available substratum required for respiration. Normally the accumulation of such substratum in the leaves of leaf-roll plants occurs at a very early stage of development; it can, however, be delayed by continuous exposure of the plants to light of low intensities, under which conditions the rate of respiration of the diseased plants approximates to that of healthy ones.

BECHHOLD (H.), GERLACH (W.), & ERBE (F.). **Die Kupferprobe zur Unterscheidung von gesunden und abgebauten Kartoffeln.** [The copper test for the differentiation of healthy and degenerated Potatoes.]—*Angew. Chemie*, xlvii, 2, pp. 26–30, 2 figs., 1934.

In order to distinguish between healthy and degenerated potato tubers, a piece of sheet-copper should be inserted into the tubers, which are left for 8 hours in the autoclave at 37° C. and for a further 16 hours at room temperature. On cutting the tubers at the end of this period, the healthy ones show an extensive dark brown to

black zone surrounding the copper, whereas the degenerated tissues show little or no alteration. The black discoloration is due to melanin formation following the wounding of the tissues [*R.A.M.*, xii, p. 531]. It was ascertained by analyses [full details of which are given] that the copper does not merely induce a local reaction in the shape of melanin formation, but diffuses throughout the blackened tissues as a catalyst. The penetration of the copper into the tissues is extensive in healthy and insignificant in diseased material. A correlation was detected between the amount of copper absorbed by the tuber and that of potassium displaced.

SPENNEMANN (F.). **Der Einfluss von Bodenart, Bodenreaktion und Düngung auf den Kartoffelschorf.** [The influence of soil constitution, soil reaction, and manuring on Potato scab.] —*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, x, 7, pp. 264–270, 1934.

The results of protracted observations in Thuringia, Germany, indicate that while potato scab [*Actinomyces scabies*: *R.A.M.*, xiii, p. 259] is not restricted to sandy soils, it is more prevalent on them and other well-aërated types than on loam or clay. It is entirely absent on weathered limestone. The hydrogen-ion concentration is not an absolute criterion for the tendency to scab on a given soil, but in general the risk of infection is higher on the alkaline types. The influence of individual fertilizers on the course of the disease was found to be barely recognizable, but that of the general scheme of manuring was readily traceable, the deleterious after-effects of liming, for instance, being apparent. Scab was observed to be more severe in dry, warm years than in cool, wet ones.

FRUTCHEY (C. W.) & MUNCIE (J. H.). **Soil treatment with mercurials for control of Potato scab.**—Abs. in *Phytopath.*, xxiv, 1, p. 9, 1934.

In three years' field and greenhouse trials, mercuric oxide, mercuric chloride, and Du Bay 965 H [cf. *R.A.M.*, xi, p. 259], applied in the row before planting, failed to control soil-borne potato scab [*Actinomyces scabies*]. Applications of mercuric oxide and mercurous chloride reduced the ratio of soil bacteria and fungi to *Actinomyces* under controlled low moisture conditions, the reverse being the case where the moisture content was high. Several strains of *A. scabies* made good growth in saturated solutions of mercuric oxide and mercuric chloride in tyrosinate liquid media.

BECKER (K. E.). **Zur Auswahl der krebsfesten Kartoffelsorten.** [On the selection of wart-immune Potato varieties.]—*Deutsche Landw. Presse*, lxi, 5, p. 54, 1934.

In order to familiarize the grower with the 155 wart [*Synchytrium endobioticum*]-immune potato varieties officially recommended in Germany, these are arranged in tabular form showing the time of maturity and the colour of skin and flesh, so that the desired types may be readily selected.

POSTELT (R.). **Krebsfester 'Industrie'-Ersatz?** [A wart-immune substitute for 'Industrie'?]—*Deutsche Landw. Presse*, lxi, 4, p. 40, 1934.

A number of substitutes for the Modrows Industrie potato variety, combining palatability with immunity from wart disease [*Synchytrium endobioticum*], are now on the German market, and of these the writer particulary recommends Ostbote (von Raddatz, Hufenberg) and Quitte (v. Zitzewitz, Muttrin). In a recent test these varieties yielded 136 and 163·5 cwt. per ¼ hect., respectively. Other promising sorts are Altgold, Sandkrone, and Herbstgelbe (von Raddatz), Treff As (v. Zitzewitz), Goldgelbe (Nordost, Königsberg), Sandkönig (Trog, Kl. Räudchen), and Flava (P[ommersche] S[aatzucht] G[esellschaft], Stettin).

SOLTAU (F.). **Erfahrungen über die Eisenfleckigkeit der Kartoffel.** [Experimental observations on Eisenfleckigkeit of Potato.]—*Deutsche Landw. Presse*, lxi, 7, p. 84, 1934.

Referring to Postelt's recent suggestions for the replacement of the Industrie potato by wart [*Synchytrium endobioticum*]-immune varieties [see preceding abstract], the writer draws attention to the importance of combined resistance to scab [*Actinomyces scabies*] and more especially to Eisenfleckigkeit [*R.A.M.*, xiii, p. 393]. The last-named disease was very severe in 1933, presumably on account of the changeable weather conditions. In the Bornim district, where the writer's observations were made, scab and Eisenfleckigkeit are seldom found in association, the alkaline reaction favouring the former being apparently adverse to the latter [cf. ibid., x, p. 126]. Varieties susceptible to scab are usually found to be resistant to Eisenfleckigkeit and vice versa. In 1933 Erdgold, Sickingen, Deodara, Parnassia, Blaupunkt, and Goldwährung proved highly susceptible to Eisenfleckigkeit; Goldfink, Wohltmann, Ackersegen, Konsum, and Delbrück less so; while Gisevius, Wekaragis, Industrie, and Odenwälder Blaue remained healthy. Of these Gisevius is the best for the locality under observation since it is also resistant to the highly prevalent scab. In general the smaller-sized tubers are considerably less liable to Eisenfleckigkeit than large ones; in an Ackersegen lot, for instance, those under 50 gm. showed only 8 per cent. affected, compared with 25 and 50 per cent. for the 50 to 100 and over 100 gm. weights, respectively. No evidence of the hereditary transmission of Eisenfleckigkeit has been obtained in the course of these investigations, the progeny of severely diseased Erdgold tubers (largely purchased at a cheap rate by local growers) [cf. ibid., xii, p. 653] on marshy soil being perfectly sound.

FOËX (E.). **Sur quelques maladies observées chez la Pomme de terre au cours de l'été 1933.** [On some Potato diseases observed in the summer of 1933.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9–10, pp. 300–309, 1933. [Received May, 1934.]

Notes are given on the following potato diseases observed in France in 1933, viz., blight (*Phytophthora infestans*), serious outbreaks of which were not common; *Colletotrichum atramentarium*,

found in a locality where it had been present ten years before [*R.A.M.*, v, p. 209]; *Verticillium albo-atrum*; an etiologically distinct condition due to *V. foëxii* [ibid., viii, p. 57], stated to be a fairly active rotting agent in certain circumstances, though in one test the progeny of affected tubers remained healthy; and a leaf spot resembling tipburn and attributed to the exceptionally dry, sunny summer [ibid., ii, p. 28].

The author considers that the pathogenicity of *C. atramentarium* has not yet been definitely established; his inoculations of healthily growing plants gave negative results, and he thinks that in all probability the fungus is unable to attack living tissues except when the plants are exposed to conditions predisposing them to attack.

KOVALEFF (N. V.). К вопросу о селекции Картофеля на устойчивость против фитофторы. [On the question of Potato-breeding for resistance to *Phytophthora*.]—*Bull. Appl. Bot., Genetics, and Plant Breeding*, Leningrad, Ser. A. (*Plant Industry in U.S.S.R.*), 7, pp. 91–96, 1933.

The author prefaces this brief note by the statement that by far the most important disease of the potato in Russia is late blight (*Phytophthora infestans*) which, in years of heavy infestation, is responsible for direct losses through tuber rot ranging from six to nine million tons or, at the average price of 18 roubles [nominally 36*s.*] per ton, roughly from 100 to 160 million roubles [£10 to 16 millions], while indirect losses due to reduction in productivity of the affected plants are much higher. The vastness of the areas under the crop, as well as the scarcity of copper sulphate in Russia, renders the control of the disease by spraying impracticable, and all the efforts of the agricultural authorities are now directed towards the breeding of new resistant varieties through hybridization of the cultivated potato with varieties recently discovered by Russian expeditions to South and Central America. Reference is made to the work which is being done in this direction in Germany [*R.A.M.*, xiii, pp. 119, 260], and also to some crosses which have been lately made in Russia with *Solanum antipoviczii, S. demissum, S. semidemissum, S. neoantipoviczii*, and *S. ajuscoense* as the resistant parents, some of which appear to be very promising.

BEAUMONT (A.). **On the relation between the stage of development of the Potato crop and the incidence of blight (Phytophthora infestans).**—*Ann. of Appl. Biol.*, xxi, 1, pp. 23–47, 1934.

From a review of the relevant literature the author concludes that the results of experiments and observations made by previous investigators do not consistently support the common opinion that potato plants above a certain age are more susceptible than younger ones to infection with late blight (*Phytophthora infestans*) [cf. *R.A.M.*, v, p. 180]. Furthermore, the analytical methods usually employed are not accurate enough to interpret the results of simple field experiments, in which the conditions governing natural infection are practically impossible to control. This point was well illustrated in co-operative experiments in 1929 and 1930 [details

of which are given] at a number of centres in England and Wales, in which the development of the blight was studied in potato plots planted at regular intervals of time, and also by observations in 1931 at the Seale-Hayne College. While no definite information was obtained from these experiments as to the individual (inherent) susceptibility of the potato plants, the results showed that in the majority of cases the 'epidemic potentialities' (a function of many closely interrelated environmental factors, and not solely dependent on the inherent susceptibility of the individual plants) of a population of mature plants are greater than those of a similar group of young plants. This does not necessarily involve the assumption of the existence of differences in susceptibility between plants of different ages, for the differences in disease intensity and resultant rate of spread follow from the increasing chances of the occurrence of primary infection foci as the plants become older, and from the greater chances of the environment (more especially the microclimate) [ibid., iv, p. 471] being suitable for the development of the parasite among the older than among the younger plants. Only carefully controlled artificial inoculation experiments under uniform optimum conditions for infection can give definite information concerning the inherent resistance or susceptibility of individual plants at different stages of growth, and further study of the problem on these lines is strongly advocated.

REYES (G. M.). **The black smut, or bunt, of Rice (Oryza sativa Linnaeus) in the Philippines.**—*Philipp. Journ. of Agric.*, iv, 4, pp. 241–270, 7 pl., 1933. [Received May, 1934.]

Apart from spore germination, all attempts at which gave negative results, the chief distinguishing morphological characters of *Tilletia horrida* [*R.A.M.*, xi, p. 289], the causal organism of black smut or bunt of rice in the Philippines, were found to agree with Takahashi's original description (*Bot. Mag.*, Tokyo, x, p. 16, 1896).

In order to determine the possibility of seed transmission of infection, 50 lightly smutted grains were sown, after soaking in sterile water, in sterilized soil in pots, with 50 similar uninfected controls. Only 36 of the 50 smutted seeds germinated and the resulting seedlings were severely stunted, while all the healthy seeds germinated and made normal growth. Fifteen of the diseased seedlings were transplanted in three pots in the open with five healthy ones in another pot as controls. Of the 15 diseased plants, ten were smutted, one died, and four were not visibly smutted, while none of the controls showed any trace of infection. The average number of culms per pot of inoculated seedlings was 6·2 compared with 10·6 for the controls, the average length being 114 cm. and 138·7 cm., and the average yield 11·36 and 25·15 gm., respectively. These results were in general corroborated by field experiments, in which 16 out of the 21 plants raised from infected seedlings were smutted, while no smut occurred in the controls from healthy seedlings. Infection was usually confined to one or two heads on a plant and often to only a few grains of a head.

The symptoms of black smut are described and the conditions favouring its occurrence and spread discussed with a view to

control. The disease is more prevalent on rice planted under irrigation during the dry weather than in the regular rice season, the early maturing varieties, such as Palagad, Sipot, Guinangan Str. 1, and Apostol, being chiefly affected, while Mancasar Str. 3 is comparatively resistant and Elon-elon apparently immune.

NIEUWPOORT (D.). **Middel erger dan de kwaal?** [Is the remedy worse than the disease?]—*De Bergcultures*, viii, 7, pp. 148–151, 1 diag., 1934.

An article is cited from the *Algemeen Landbouwweekblad voor Nederlandsch-Indië*, 13th January, 1934, describing a bark disease in seven-year-old [*Hevea*] rubber bud grafts and seedlings on a Yang plantation. Tapping had been discontinued on the estate for some six months, and in most cases the disorder was confined to the regenerated bark, which had completely died off and peeled away from the wood. Negative results were given by inoculation experiments with various fungi isolated from infected material, and it is considered probable that the disease (which attacked the bud grafts to the extent of 37 per cent. while only 12 per cent. of the seedlings were affected) is of physiological origin. It is not unlikely (and this line of investigation is being pursued) that the coal-tar compounds applied to the bark for the control of stripe canker [*Phytophthora palmivora*: *R.A.M.*, xi, p. 600] may have weakened it to such a degree as to provide an ideal substratum for normally harmless fungi.

In this connexion the writer refers to the excellent results which have been obtained in the control of stripe canker and also of the more intractable mouldy rot [*Ceratostomella fimbriata*: ibid., xiii, p. 125] with an ointment known as 'Product A 2295', supplied by the Socony Vacuum Corporation. Great care must be taken not to apply the disinfectant to damp bark, a practice leading to exactly the same symptoms as those described in the article quoted above. Otherwise no injury has been sustained even on the most drastically tapped surfaces. The quantity of A 2295 required for each treatment varies according to the length of the tapping cuts between 300 and 600 gm., and the number of applications depends on the climate and on the situation of the trees, those in damp, shady ravines needing up to ten a month, while in airy, open plantations it is sufficient to give a treatment as soon as incipient infection is observed. In any case, the cost of disinfection by this method is trifling compared with the immense damage averted by its use.

TAYLER (V. A.). **Oidium heveae.**—*Bull. Rubber Growers' Assoc.*, xvi, 1, pp. 8–10, 1934.

Over large areas in Malaya, particularly in the south, the hillsides of planted rubber, which a few years ago were fresh and green, now present a greyish, debilitated appearance, partly due to the branches, owing to their scanty foliage, becoming bleached by exposure to the sun. Observation and comparison of different areas did not support the view that this condition is due to defective cultivation rather than to *Oidium heveae* [*R.A.M.*, xiii, p. 181], alleged recovery from which is often only apparent, inasmuch as

the secondary leaves on affected trees, though seldom attacked, are much smaller than the original ones, and frequently only a few are present, generally because the new shoots die off, leaving the branches with only a new terminal whorl. Affected leaves remaining on the tree are often distorted, sometimes devoid of tips, show yellowish blotches when held up to the light, and may have only one leaflet. The author expresses his conviction that *O. heveae* is very largely responsible for this depreciated condition of the foliage, which in turn adversely affects bark renewal.

CHAUDHURI (H.) & SACHAR (G. S.). **A study of the fungus flora of the Punjab soils.**—*Ann. Mycol.*, xxxii, 1–2, pp. 90–100, 1934.

An annotated list, with English diagnoses, is given of 32 fungi from field, garden, coarse-grained alkaline, and humus soils in the Lahore district of the Punjab, India, including eleven species of *Aspergillus* (two new) and three (one new) of *Penicillium*. Most of the organisms recorded are already known as soil-inhabitants in other countries.

CHOLODNY (N. G.). **A soil chamber as a method for the microscopic study of the soil microflora.**—*Arch. für Mikrobiol.*, v, 1, pp. 148–156, 4 figs., 1934.

Full details are given of a contrivance, termed a soil press, which the writer has constructed with a view to further simplification of the study of the soil microflora [*R.A.M.*, xii, p. 324]. By this method a uniformly thick layer of moist soil, in the centre of which is a cylindrical space (about 4 mm. in diam.), is inserted between two slides. The soil micro-organisms develop within the chambers on the clean surface of the glass, the fungi forming fructifications which are generally readily determinable.

MARTIN (J. P.). **Pathology.**—*Ann. Rept. Ctte. in charge of the Exper. Stat. for the year ending September 30th, 1933* (ex *Proc. Hawaiian Sugar Planters' Assoc., Fifty-third Ann. Meeting, 1934*), pp. 24–35, 1934.

This report contains, among others, the following items of phytopathological interest. Studies by C. W. Carpenter have demonstrated that in some soils biological factors are largely responsible for the failure of commercial varieties of sugar-cane, and in soils of the phosphate-fixing type, where an unbalanced condition of nutrient occurs, the canes are attacked by *Pythium aphanidermatum* [*R.A.M.*, xii, p. 723]. Attack by the fungus is greatly increased by fertilizers yielding an excess of nitrogen and deficiency of calcium, iron, and phosphorus. *P. aphanidermatum* was abundantly present on the roots of Sudan grass [*Andropogon sorghum* var. *sudanensis*], in some instances depressing the growth. In pot studies P.O.J. 2878 and its related varieties were highly resistant to *P. aphanidermatum*. Evidence has also been obtained that aluminium toxicity may be an important factor in growth failure and may be ameliorated by potash applications.

In other experiments by Carpenter, mosaic leaves of Ba. 11569 cane were kept for ten minutes at temperatures ranging from 52°

to 56° C. and attempts were then made to transmit the disease from the treated to healthy Ba. 11569 leaves by Sein's needle-prick method [ibid., ix, p. 678]; the results of these inoculations indicated that the thermal death point of the virus lies between 53° and 54°. Knife transmission of mosaic has been effected with the susceptible variety Ba. 11569.

Symptoms of chlorotic streak [ibid., xii, p. 722] developed rapidly on sugar-canes in fields flooded during heavy storms, the attack being apparently largely due to secondary infection. Chlorotic streak is a problem only in certain localities of Hawaii, and experiments are in progress to ascertain its cause, its manner of transmission otherwise than by diseased cuttings, and the losses sustained through it.

Inoculation tests with various organisms isolated from nodal stalk rot [the symptoms of which are described: ibid., xii, p. 723] gave negative results.

KERR (H. W.). **Recent developments in the agriculture of Sugar Cane in Queensland.**—*Empire Journ. Exper. Agric.*, ii, 5, pp. 20–28, 1933.

When plant breeding was first instituted in Queensland in 1921, several very promising sugar-cane varieties, e.g., S.J. 4 and S.J. 7 were evolved, but the high susceptibility of the latter to leaf scald [*Bacterium albilineans*: *R.A.M.*, xiii, p. 325] soon necessitated its elimination. Since 1928, when a selection of the best breeding canes employed in Java was introduced to South Johnstone, much attention has been paid to the disease resistance of the progeny from all desirable crosses. Pathological investigations aiming at the early mass elimination of susceptible seedlings are in progress. In 1930 a breeding sub-station was established in the Cairns district, where cross-pollination is greatly facilitated by the free flowering of the canes. Seedling propagation now takes place at the Mackay and Bundaberg Stations, some 5,000 being planted annually at each of these centres and 10,000 to 12,000 at South Johnstone. In the course of a brief statement on disease researches [already noticed in this *Review*], it is mentioned that promising results in the control of gumming [*Bact. vascularum*: ibid., xii, p. 787] have been obtained by the hot-water treatment of infected cuttings.

Experiment Station notes.—*South African Sugar Journ.*, xviii, 1, pp. 11–13, 1934.

Notes are given on the performance of a number of new sugar-cane varieties at the Mount Edgecombe Experiment Station, Natal, in 1933. Co. 281, released for the first time during the current season, is stated to be in many ways the most promising variety as yet distributed from the Station. It is highly resistant to streak [*R.A.M.*, xii, p. 658] but somewhat susceptible to mosaic, the danger from which in Natal, however, has been much reduced and the sources of infection minimized. Co. 290 is highly resistant to streak and exceptionally so to mosaic, while P.O.J. 2728 may be considered immune from both diseases for all practical purposes. On the other hand, C.H. 64/21, an improved Uba, is highly suscep-

tible to streak, and its extended cultivation cannot be recommended now that better varieties are available.

BISSINGER (G. H.). **Some of the problems now facing the Research Bureau of the Philippine Sugar Association.**—*Sugar News*, xv, 1, pp. 19–24, 1934. [Spanish translation.]

The Research Bureau of the Philippine Sugar Association is confronted by two pathological problems in the shape of yellow spot [*Cercospora kopkei*: *R.A.M.*, xi, p. 205] and smut [*Ustilago scitaminea*: ibid., xii, p. 723]. P.O.J. 2878, which promises to supplant most of the old cane varieties grown in the Philippines, has proved to be highly susceptible to yellow spot, many fields showing nearly 100 per cent. infection. This disease is suspected to cause deterioration in the quality of the juice, and studies are in progress to verify the extent of the damage.

Smut has been present for some time in southern Luzon and is stated to be now assuming a serious form in the north of the province. Three years ago the writer observed one slightly infected field in the Isabela district of Negros, but recent reports indicate that smut has since spread as far north as Ma-ao. In order to avoid scattering the spores by roguing and removing the plants for burning, the following method of treatment is recommended. A 5-gallon tin partly filled with paraffin should be brought to the field, the blackened tips of the shoots wetted with the oil to prevent spore dispersion, and the stalks, after cutting off the top ends, immersed upside down in the tin. When the tin is full it can be taken to the edge of the field and the tops burnt.

SĂVULESCU (T.) & RAYSS (T.). **Troisième contribution à la connaissance des Péronosporacées de Roumanie.** [Third contribution to the knowledge of the Peronosporaceae of Rumania.] —*Ann. Mycol.*, xxxii, 1–2, pp. 36–51, 9 figs., 3 graphs, 1934.

An annotated list is given of 51 species of Peronosporaceae collected by the authors in Rumania since the publication of their previous contributions to the same subject [*R.A.M.*, xi, p. 605], bringing the total number so far known in the country to 162 on 248 hosts. *Peronospora jaczewskii* n. sp. ad int. on *Gypsophila muralis* appears to agree with a species recorded by Tranzschel and Jaczewski on the same host near Smolensk, Russia, which they considered to be related to *P. dianthi* (*Mycol. Flora Europ. Asiat. Ross.*, 1901).

P. rosae-gallicae n. sp. on *Rosa gallica* (stated to be the first record of a *Peronospora* on a wild rose) differs from *P. sparsa* [ibid., xi, pp. 459, 784] in its longer conidiophores and light brown conidia, 13 to 24 by 11 to 21 (mean 18·37 by 15·31) μ in diameter.

Living leaves of *Lathyrus hirsutus* are attacked by *P. lathyri hirsuti* n. sp., forming a dense, greyish-purple growth. The conidiophores arise singly or in groups from the stomata and measure 375 to 560 by 6 to 9 μ; they are furnished with 5 to 6 dichotomous, slightly curved or almost straight branches, terminating in straight or slightly curved forks 6 to 36 μ in length. The pale greyish-purple, ellipsoidal conidia are usually papillate, 12 to 27 (generally 18 to 24) by 11 to 24 (14 to 20) μ, mean 20·46

by 17·46 μ. The oospores, which are very abundant in decaying leaves, measure 33 to 42 μ in diameter and have a yellow, reticulate epispore.

SHEAR (C. L.). **Penicillium glaucum of Brefeld (Carpenteles of Langeron) refound.**—*Mycologia*, xxvi, 1, pp. 104–107, 3 figs., 1934.

In view of the ambiguity regarding the identity of the fungus described by Brefeld, who obtained its perithecial stage, as *Penicillium glaucum* Link, and of the confusion already existing in the use of this name, the writer proposes to call this organism, rediscovered apparently for the first time by O. A. Reinking in Honduras soils in 1931, *Carpenteles asperum* nom. nov. Cultures from ascospores and conidia reproduced the *Penicillium* conidia and the perithecia and ascospores as described by Brefeld. The generic name was proposed by Langeron (*Comptes rendus Soc. de Biol.*, lxxxvii, p. 343, 1922) for ascogenous species of *Penicillium*, *P. glaucum* (Lk) Brefeld to represent the type. The combination *C. glaucum* was used by Clements & Shear (The Genera of Fungi, p. 297, 1931). The specific name *asperum* refers to the spinulose ascospores. Under this new scheme of classification *P. brefeldianum* Dodge (*Mycologia*, xxv, p. 90, 1933) would become *C. brefeldianum* (Dodge) comb. nov. and *P. javanicum* van Beyma (*Ver. Kon. Akad. Wetensch.*, Amsterdam, xxvi, p. 16, 1929) *C. javanicum* (van Beyma) comb. nov.

PETRI (L.). **Alcune considerazioni sopra i generi 'Deuterophoma' e 'Blastophoma'.** [Some reflections on the genera *Deuterophoma* and *Blastophoma*.]—*Phytopath. Zeitschr.*, vii, 1, pp. 117–119, 1934.

Referring to Klebahn's recent establishment of a new genus, *Blastophoma* [*R.A.M.*, xii, p. 790], for those *Phoma*-like Sphaeropsideae characterized by exogenous (budding) conidial formation, the writer points out that this genus may be considered synonymous with his genus *Deuterophoma* (type species *D. tracheiphila*, the causal organism of 'mal secco' of lemons in the Mediterranean Basin) [ibid., x, p. 182], if considered merely under the aspect of an astromatic Sphaeropsid with budding exogenous pycnospores. A wider significance, however, attaches to the designation of *Deuterophoma*, which is intended to express the relatively simple organization of the pycnidia in those astromatic species forming conidia by exogenous budding from most of the cells of a pseudoparenchyma occupying the centre of the pycnidium instead of from only the cells of a hymenium lining the cavity. On the same basis *Sclerophoma* [cf. ibid., iii, p. 305] corresponds to Klebahn's *Eusclerophoma*.

BOEDIJN (K. B.). **Ueber einige phragmosporen Dematiazeen.** [On some phragmosporous Dematiaceae.]—*Bull. Jard. Bot. Buitenzorg*, Sér. III, xiii, 1, pp. 120–134, 4 figs., 9 graphs, 1933.

The author describes and figures a new species of *Acrothecium*, *A. indicum*, which he regards as closely related to *A. multisporum*, the type species of *Acrothecium*. He concludes that the well-

known *Acrothecium lunatum* Wakker [*R.A.M.*, v, p. 136; vi, p. 144; vii, p. 712; ix, p. 507] is not a good *Acrothecium*, and makes it the type species of a new genus *Curvularia*, as *C. lunata*. Among other species, *Napicladium andropogonis* Zimmerm. becomes *C. andropogonis*, *A. penniseti* Mitra [ibid., i, p. 161] becomes *C. penniseti*, and *Helminthosporium inaequalis* Shear [ibid., ix, p. 532] becomes *C. inaequalis*.

JOCHEMS (S. C. J.). **Verslag van het Deli Proefstation over het jaar 1933.** [Report of the Deli Experiment Station for the year 1933.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxxix, 56 pp., 1934.

The following are among the items of phytopathological interest in this report. On the two series of tobacco plots permanently sterilized [by steam] against slime disease [*Bacterium solanacearum*: *R.A.M.*, xii, p. 471], the condition of the crop in 1933 was fully equal to that of 1930, when sterilization was commenced [ibid., x, p. 561]. As in 1932 only one bed on one of the series developed slime disease in 1933.

Tomato plants were grown in frames containing soil of varying composition and hydrogen-ion concentration in order to test the relation between soil reaction and infection with *Bact. solanacearum*, field observations and experiments having indicated that the disease was prevalent in soils near neutrality but absent from those that were strongly acid or alkaline. In contrast, however, to tobacco and *Ricinus communis*, which developed slime disease in these soils when they were of a moderately acid or alkaline reaction, tomatoes did not contract infection in black dust ['zwarte stofgrond'] or red soils. It was thought that the disease-free soils might not be actually free from the bacteria but that the infective capacity of the latter was merely inhibited by the degree of acidity or alkalinity. No slime disease occurred, however, in a series of nine frames filled with these soils that had given no infection, even when the hydrogen-ion concentration was adjusted to range from P_H 3·8 to 8·2, whence it may be inferred that the absence of symptoms in certain soils of an acid or alkaline reaction does actually connote the freedom of such soils from *Bact. solanacearum*.

The rough handling of seedlings during raising operations is believed to be largely responsible for the spread of ordinary mosaic ('peh-sim') [ibid., xiii, p. 328], which is conveyed from plant to plant as the basal leaves are broken off by contaminated fingers.

Information has been received from A. Meurs that the *Pythium* spp. isolated from Sumatra tobacco [loc. cit.] and taken to Baarn, Holland, for closer study are *P. aphanidermatum*, *P. myriotylum* Drechsler [ibid., x, p. 211], and a new species named *P. deliense* Meurs.

CALDWELL (J.). **Possible chemical nature of Tobacco mosaic virus.**—*Nature*, cxxxiii, 3353, p. 177, 1934.

In agreement with Barton-Wright and McBain [*R.A.M.*, xiii, p. 329], the writer detected the presence of the tobacco mosaic virus in the crystalline part of the mixed phosphate eluate precipitated from the juice of inoculated *Nicotiana glutinosa* plants,

but the amount declines progressively with each successive washing until after repeated treatment very little remains. At this stage a trace of organic nitrogen is also revealed by microanalysis, no nitrogen-free virus-containing crystals having been obtained. No evidence is in fact forthcoming that the virus in the crystals is anything more than an impurity.

The absence of any specific relation between the crystals and the virus is readily demonstrable. On the acidification of the potassium-hydrogen phosphate eluate from healthy tobacco tissue and the addition of two volumes of acetone, a crystalline as well as a colloidal precipitate is obtained. That the crystals are due to the presence of potassium-hydrogen phosphate is further shown by the fact that the addition of two volumes of acetone to one of *M*/1 KH_2PO_4 in aqueous solution results in a heavy white precipitate of rhombic crystals, indistinguishable in outline from those obtained in the experiments referred to above.

CORDINGLEY (H.), GRAINGER (J.), PEARSALL (W. H.), & WRIGHT (A.).—**The effect of mosaic disease upon certain metabolic products in the Tobacco plant.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 78–89, 1934.

The results of the experiments briefly described in this paper showed that in tobacco (*Nicotiana tabacum*) leaves infected with ordinary tobacco mosaic [*R.A.M.*, xii, p. 728] the proportion of nitrogen is higher and the proportion of carbohydrates lower than in healthy leaves, the differences being apparently increased during photosynthesis. In leaves kept in the dark for 68 hours, the carbohydrate loss on the dry weight basis was the same in both healthy and diseased leaves, but the loss fell chiefly on the insoluble carbohydrates in the healthy, and mainly on the disaccharides in the diseased leaves. The indications were that in diseased leaves protein breakdown is retarded, and insoluble substances are less readily hydrolyzed, the diseased leaves thus resembling older healthy leaves in their metabolism.

SAMUEL (G.). **The movement of Tobacco mosaic virus within the plant.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 90–111, 1 pl., 4 diags., 1934.

The results of the author's study [by four methods, details of which are given] of the movement of tobacco mosaic virus [*R.A.M.*, xii, p. 791] chiefly in artificially inoculated tomato plants indicated, in agreement with those obtained by Holmes in tobacco plants [ibid., xii, p. 118], that for the first three or four days the virus remains confined to the inoculated leaf, the length of this period being in direct relationship with the greater or lesser growth activity of the host. After penetrating the stem, the virus travels first very rapidly down to the roots, and usually about a day later with equal rapidity to the top of the plant. In the earliest stages of entering the stem, the virus particles may be separated from each other by considerable distances, since successive samples taken from the diseased stem may yield lengths of 2·5 cm. free from infection, intercalated irregularly between portions containing the virus. When developing fruit trusses are present on the stem,

part of the virus may travel upwards as far as these trusses at the time when the initial downward movement is occurring, and it may then enter the developing fruits, while adjacent leaves remain uninfected for days or weeks.

In experiments with pot plants it was shown that after the initial rapid infection of the young developing leaves at the top of the plant, the more mature leaves were successively invaded from the top downwards and from the base upwards, until the whole plant was invaded. Complete invasion occurred very rapidly in small, vigorously growing plants, but took three weeks or more in those of medium size, and up to two months in large fruiting plants. Complete invasion never occurred when large tobacco or tomato plants with a number of mature leaves were inoculated in the field. The mature leaves remained free from the virus, apart from a limited invasion along the midribs, for periods of over three months after inoculation.

In a discussion of these results it is considered that they favour the theory that the virus moves slowly from cell to cell via the plasmodesmen, and is also rapidly distributed through the plant by way of the phloem. Particular mention is made of the possible value of the tobacco mosaic virus as an indicator in the study of the phloem movements.

WOODS (M. W.). **Cellular changes in ring-spot.**—*Contrib. Boyce Thompson Inst.*, vi, 1, pp. 51–67, 3 figs., 1934.

Continuing his greenhouse studies of tobacco ring spot [*R.A.M.*, xiii, p. 131], the author states that the lesions formed on Turkish tobacco during the summer were normally much less necrotic than those formed in winter, and that in such lesions there appeared to be a certain connexion between the necrotic zonation and alternations of light and darkness. The cytological, and especially the histological changes caused by the virus depend in a large measure on the age of the affected tissues. In relatively mature leaves, both in primary and systemic lesions, the changes consist in a disintegration of the chloroplasts, either preceding, or coincident with, a modification of the cytoplasm resulting in increased permeability of the protoplast, and followed by the degeneration of the nucleus. Usually the chloroplasts become rather gorged with starch before they degenerate. The diseased cells collapse from desiccation, usually followed by oxidation to a brown colour. Sometimes, however, little or no plastid disintegration occurs before the death of the cell. In chlorotic areas in systemically infected leaves the development of the plastids may possibly be retarded. Some marked changes such as hypertrophy and lack of differentiation of some of the leaf cells near the necrotic areas were sometimes observed in systemic lesions formed on young leaves, but in nearly mature leaves the structure was little affected beyond the death of certain of the infected tissues.

In *Nicotiana rustica*, *N. glutinosa*, *N. glauca*, and *Petunia* sp. the cytological and histological changes caused by inoculation with the ring spot virus were much the same as those in nearly mature leaves of Turkish tobacco, but in *Vigna sinensis* the vascular tissues of the leaf were much more susceptible to the action of the

virus than in Turkish tobacco, where only small veins and the border parenchyma of larger ones are normally affected. Some details are also given of the effect of varying environmental conditions on the development of the ring spot lesions.

BLOOD (H. L.). **The control of Tomato bacterial canker (Aplanobacter michiganense E. F. S.) by fruit-pulp fermentation in the seed-extraction process.**—*Proc. Utah Acad. Sci.*, x, pp. 19–23, 1933. [Abs. in *Exper. Stat. Record*, lxx, 2, p. 197, 1934.]

The results so far obtained in preliminary tests carried out in Utah are considered to justify the recommendation to tomato seed producers of submitting the fruit-pulp to fermentation before seed extraction for the control of *Aplanobacter michiganense* [*R.A.M.*, xiii, p. 403]. The fruit may be placed in a container, crushed with an electrically driven rotary knife or mixer, and left to ferment without added water. When large quantities of seed are to be extracted, standard pulping or grinding machines may be used and the material run into vats and allowed to ferment for from three to six days at 68° F. or under.

GOSS (R. W.) & FRINK (P. R.). **Cephalosporium wilt and die-back of the White Elm.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 70, 24 pp., 12 figs., 2 graphs, 1934.

A species of *Cephalosporium*, believed to be identical with that attacking elms in Ohio and other parts of the United States [*R.A.M.*, xii, p. 404], has been found causing a disease of *Ulmus americana* in Nebraska. The initial symptoms of the disturbance are a slight drooping and yellowish-green mottling of the leaves, followed by upward rolling and brown discoloration, and ultimately by die-back of the twig or branch. These external features are usually preceded or accompanied by a diffuse brown streaking of the vascular tissue. When the trunk is involved the foliage is dwarfed, yellowish, rolled in the spring, and sometimes a rapid wilt of the whole top ensues. Inoculation of the roots, trunk, or twigs of seedlings with pure cultures caused typical symptoms, the first signs of infection appearing sometimes in 11 days and death within three months. Infection advanced more rapidly upwards than towards the roots. Chinese elms (*U. pumila*) failed to take the inoculations. A survey of the street plantings of elms at Lincoln showed that some 30 per cent. were infected or killed by the *Cephalosporium*, or had been replaced on account of the disease.

On potato-dextrose agar the fungus is characterized by a moderately branched, hyaline, septate mycelium and simple, 0- to 4-septate conidiophores, 7 to 18 μ long, bearing at their apices a succession of elliptical, hyaline, unicellular conidia, 4·5 by 1·9 μ, united by mucilage into globular heads of 50 to 80 spores. The minimum, optimum, and maximum temperatures for growth were above 3·5°, 25°, and below 35° C., respectively. The fungus caused a gradual adjustment of the reaction of the media towards neutrality.

Control methods should include the removal of diseased material from nurseries and ornamental plantings. Further studies of varietal reaction are needed and also of the possibilities of soil and

insect transmission—the latter probably being an important factor in the dissemination of the fungus by reason of its position within the tree.

ARNAUD (G.) & BARTHELET (J.). **Les chancres du Cédrela et du Robinia.** [Cankers of *Cedrela* and *Robinia*.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9–10, pp. 323–332, 2 pl., 3 figs., 1933. [Received May, 1934.]

During the last ten or fifteen years *Cedrela sinensis* trees in the avenues of Paris have developed one or two large cankers resembling those produced on apples by *Nectria galligena* and situated about 2 m. from the ground on the trunk or main branches. As a rule, the canker starts at the point of insertion of a branch, and it can gradually spread more than half way through the thickness of the trunk, frequently attaining a length of 30 to 40 cm. Some trunks are affected from the ground to the first branches, apparently as a result of several cankers joining together. Affected trees succumb very slowly. Isolations from the margins of diseased tissues gave a *Fusicoccum* which, in culture on oatmeal agar, gave rise to brownish pycnidia, 2 to 5 mm. in diameter, with numerous loculi (which later may fuse to form irregular cavities) containing rod-shaped, bent B spores measuring 30 by 0·8 μ. The fungus, designated *F. cedrelae* n. sp. ad interim, scarcely differs from the B spore stage of a *Phomopsis* in its final characters, the two genera being almost identical. It is regarded as being mainly a wound parasite.

Acacias (*Robinia pseud-acacia*) both in the north and south of France are commonly attacked by *Diaporthe oncostoma*, chiefly in its pycnidial form, *Phomopsis oncostoma*. As a rule, the trees do not appear to be cankered, the fungus killing off the young, slender branches, which become covered with fructifications.

RICHTER (H.). **Krebs und Rindenbrand der Pappel.** [Canker and bark blight of the Poplar.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 262–267, 2 pl., 1933.

The first record of the *Nectria* canker of poplars, which has caused so much damage of recent years in Germany [*R.A.M.*, xii, p. 800], is stated by A. Poskin to date from 1875, when it was observed on *Populus canadensis* in Belgium [ibid., xii, p. 677]. The disease has also long been known in Holland, where it was studied by Miss Westerdijk and A. van Luijk and attributed to *N. coccinea* [ibid., iii, p. 430]; it first appeared in Germany near the Dutch border and spread to the Rhine Province. The writer has shown that a variety (*sanguinella*) of *N. coccinea* is able to infect poplar cortex but not to produce true canker [ibid., xii, p. 677]. In 1931 both Jahn and Liese drew attention to the ravages of poplar canker in Westphalia, the former ascribing the infection to *N. coccinea* var. *sanguinella* (*Deutscher Forstwirt*, xiii, p. 131) and the latter to *N. galligena* var. *major* [*R.A.M.*, x, p. 698]. The writer's extensive comparative studies in the affected localities and on herbarium material have confirmed the above-mentioned determinations and indicate that more than one species of *Nectria* can cause the disease. A strain of *N. galligena* identical

with that responsible for fruit tree canker was isolated from diseased poplars in the Rhine Province, the same species having already been found by Wollenweber on *P. nigra* in Norway in 1925 (Fusarium-Monographie, p. 467) [ibid., x, p. 626]. The following are the mean dimensions of the ascospores of the species and varieties of *Nectria* associated with poplar canker: *N. coccinea* var. *sanguinella* 17·72 by 4·86 μ, *N. galligena* 16·07 by 6·76 μ, and *N. galligena* var. *major* 19·03 by 7·03 μ.

As in previous experiments, the author's inoculation tests on poplars in 1931 with *N. coccinea* var. *sanguinella* and *N. galligena* var. *major* gave negative results as regards actual canker formation, though the slowness with which the wounds healed points to a certain infective capacity. The inoculated trees, moreover, were growing on a light, loamy sand which does not favour canker either in poplars, beeches, or apples. The poplar varieties hitherto observed to contract *Nectria* canker are *P. canadensis* and *P. robusta*, while *P. charkowiensis* appears to be also susceptible. Various insects have been observed in association with the cankers and may be actively concerned in transmission of their cause. Poplar canker can be directly combated only by the removal and burning of diseased trees, or in milder cases by the excision of the infected parts. An attempt should also be made to obtain resistant individuals from seed [cf. ibid., xiii, p. 338], while the extended cultivation of the indigenous *P. nigra, P. alba,* and *P. tremula* also deserves consideration.

Notes are given on the symptoms and distribution of the so-called 'French canker' of poplars [ibid., xiii, p. 408], which has not yet been recorded in Germany and is stated to differ from the *Nectria* disease. As in the latter case, the rapidly growing varieties, such as *P. canadensis, P. eugenei,* and *P. nigra* var. *italica* are the most susceptible.

The bark blight caused by *Dothichiza populea* [ibid., xii, p. 790] is stated to be spreading extensively in Germany. A brief description of the disease is given.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, October–December, 1933. Quarantine and other official announcements.—pp. 271–274, 277–288, 1934.

A further revision of Rice Quarantine No. 55 [*R.A.M.*, xiii, p. 416] provides for the entry into the United States of rice straw and rice hulls after treatment by steam or some other method approved by the Bureau of Plant Quarantine against certain fungous diseases and insect pests, to be carried out under qualified supervision at recognized ports where the proper facilities are available.

A summary (dated 1st December, 1933) is given of the quarantine restrictions governing the importation of plants and seeds into the Argentine Republic.

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MAGEE (C. J.). **Tomato leaf mould. A disease new to glasshouse crops in New South Wales.**—*Agric. Gaz. New South Wales*, xlv, 1, pp. 24–26, 1 fig., 1934.

In this brief popular note the author reports what is apparently the first appearance of tomato leaf mould (*Cladosporium fulvum*) in New South Wales in the winter of 1933. It caused severe losses to most of the growers in the more important centres where tomatoes are grown under glass, and was also recorded affecting early outdoor tomatoes in the vicinity of infected glasshouses. It is not believed that the disease is likely to do considerable damage in glasshouses during the spring months, as the houses are not heated, but later in the season it is thought that both temperature and humidity may often favour infection and the development of the fungus, and for this reason some recommendations are given for the control of the disease [*R.A.M.*, xi, p. 211 ; xii, p. 403].

STAPP (C.). **Vom 'Ulmensterben'.** [On the 'die-back of Elms'.] —*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 276–282, 1933.

Discussing the various theories advanced in connexion with the etiology of the die-back of elms in Germany, the writer reaffirms his conviction that the primary part is taken by *Ceratostomella ulmi* in the causation of the disease [*R.A.M.*, xi, p. 336 ; xiii, p. 406]. Recent investigations on the problem are summarized, and a list is given of the legislative measures enacted in Germany against the die-back [ibid., xii, p. 591].

ANSALONI (A.). **La moria degli Olmi e la diffusione in Italia dell' Olmo siberiano.** [The die-back of Elms and the distribution in Italy of the Siberian Elm.]—118 pp., 24 pl., Bologna, Edit. Selva, 1934. [Abs. in *Journ. Forest. Suisse*, lxxxv, 5, pp. 119–120, 1934.]

This is a review by H. Badoux of a treatise on the die-back of elms (*Ulmus campestris*) due to *Graphium* [*Ceratostomella*] *ulmi* in Italy, where this tree serves the practical purpose of supporting vines, especially in Romagna and Emilia [*R.A.M.*, xii, p. 734], in addition to its ornamental value. Promising results have been obtained in various parts of the country by experiments on the part of landowners and agriculturists, with the collaboration of

the Silvicultural Research Institute of Florence, in the cultivation of *Ulmus pumila*, which seems well adapted to replace the susceptible *U. campestris* [ibid., xiii, p. 406].

HAHN (G. G.) & AYERS (T. T.). **Dasyscyphae on conifers in North America. I. The large-spored, white-excipled species.**—*Mycologia*, xxvi, 1, pp. 73–101, 6 pl., 1934.

Following the detection in 1927 of the European larch (*Larix europaea* DC.) canker in Massachusetts [*R.A.M.*, vii, p. 285], a study was made of the relationships of the fungi associated with the disease. Detailed morphological, cultural, and taxonomic investigations indicate that the introduced parasite identified on imported *L. europaea* and *L. leptolepis* should be known as *Dasyscypha willkommii* (Hartig) Rehm [ibid., vii, p. 209; ix, pp. 90, 617] and not as *D. calycina* (Schum.) Fuckel [ibid., xi, p. 141]. The organism was consistently found in the cankers on living tissue. The blue form [var. *glauca*] of Douglas fir (*Pseudotsuga taxifolia*) growing in close proximity to infected *L. europaea* did not contract the disease; inoculations with *D. willkommii* were successful on young larch trees, but not on dead or dying tissues of the same host or on healthy or dying Douglas firs.

D. calycina was found to be morphologically and physiologically distinct from *D. willkommii* and should be recognized as a separate species, of which an amended description is given in English. Its purely saprophytic behaviour on *L. europaea*, *L. leptolepis*, and *P. taxifolia* has been sufficiently proved by inoculation experiments. It is believed to have been introduced into the United States at the same time as *D. willkommii*, being co-extensive with the latter. Both the foregoing species of *Dasyscypha* were found to differ morphologically and physiologically from the large-spored native forms, hitherto identified with one or the other but which the authors describe [with English and Latin diagnoses] as new species, namely, *D. oblongospora* on *L. laricina*, *L. europaea*, *L. leptolepis*, *P. taxifolia* (blue form), *Picea pungens*, *Pinus pungens*, and *P. virginiana*; and *D. occidentalis* on *L. occidentalis*, *L. laricina*, and *L. leptolepis*. These species do not cause canker on their hosts.

LIESE (J.). **Weitere Mitteilungen über die Douglasiennadelschütte.** [Further notes on the needle fall of Douglas Firs.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 268–270, 1933.

In view of the extension of the leaf fall disease (*Rhabdocline*) [*pseudotsugae*] of Douglas firs (*Pseudotsuga taxifolia*) over a much wider area of Germany than was originally realized, the writer relinquishes his advocacy of direct control by eradication in favour of v. Geyr's plan for the gradual development of resistance by individual selection [*R.A.M.*, xii, pp. 66, 67]. At the time of writing in 1933 there were no less than 60 centres of infection, mostly in Mecklenburg, Schleswig-Holstein, and Brandenburg, but also scattered through Pomerania, Brunswick, Oldenburg, Lower Silesia, and the Palatinate.

LAGERBERG (T.). **Phomopsis pseudotsugae Wilson, en i Sverige obeaktad barrträdsparasit.** [*Phomopsis pseudotsugae* Wilson, a conifer parasite hitherto unnoticed in Sweden.]—*Svenska Skogsvårdsfören. Tidskr.*, xxxii, 1–2, pp. 71–86, 4 figs., 1934. [English summary.]

Phomopsis pseudotsugae [*R.A.M.*, xiii, p. 199] was identified for the first time in Sweden in 1927 by G. G. Hahn on the trunk of a twelve-year-old Douglas fir (*Pseudotsuga taxifolia* var. *caesia*) from Vestrogothia. The disease was originally observed by the writer in 1917 and attributed to *Phoma pitya* [*Sclerophoma magnusiana*: ibid., viii, p. 278; xii, p. 790], an error that was corrected in *Skogen*. p. 262, 1929. On a joint inspection with Hahn of the 15-year-old Douglas fir stand in the arboretum of the College of Forestry the presence of *Phomopsis pseudotsugae* was also detected.

The studies made by M. Wilson on the fungus in Great Britain are summarized [ibid., v, p. 259]. As far as the writer's observations extend, the place of origin of the trees does not influence their reaction to *P. pseudotsugae*. In Sweden infection occurs principally on *Pseudotsuga taxifolia* var. *glauca*, the young shoots on stems and branches being attacked and cankers formed on the thicker parts exactly as described by Wilson. In 1932 four- to five-year-old larches (*Larix leptolepis*) in Scania were also found to be infected by *Phomopsis pseudotsugae*, which had evidently penetrated the bark in the previous autumn through wounds inflicted by rabbits or voles. The upper part of the main stem on some 20 per cent. of the trees was killed, the pycnidia of the fungus being developed in profusion on the area immediately above the living part of the trunk. In this case the symptoms do not altogether agree with those described by Wilson, whose observations, however, were made on 12- to 18-year-old trees.

CAMPBELL (A. H.). **Zone lines in plant tissues. II. The black lines formed by Armillaria mellea (Vahl) Quél.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 1–22, 3 pl., 4 figs., 1934.

The results of the investigation described in some detail in this paper showed that, as in *Xylaria polymorpha* [*R.A.M.*, xii, p. 544], the black lines formed in wood infected by *Armillaria mellea* are the sectional outlines of closed bodies, enclosing an extensive matrix of the substratum, the formation of which is very similar in both fungi [loc. cit.]. These bodies, for which the name pseudosclerotia is suggested, because by the structure of their limiting walls and by their physiological function they partake of the nature of a true sclerotium, are continued on the surface of the substratum by an effused mycelial mass (the xylostroma) which is partly immersed in the wood and consists of a black rind of bladder hyphae with a medulla of hyaline ones. The xylostroma, probably owing to its immersion in a hard woody substratum, is endowed with the power of apical growth, resulting in the free portion of this body growing out into a number of slender flattened strands below the bark of the tree (*Rhizomorpha subcorticalis* of Persoon), from which the more cylindrical strands (*R. subterranea*) eventually grow out into the soil through the cracks in the bark. The formation of the

pseudosclerotia and the development of the rhizomorphs were also observed by the author in pure cultures of *A. mellea* on synthetic media and sterilized blocks of wood.

The paper terminates with a short account of the biology of *A. mellea*, with particular reference to the significance of the pseudosclerotium in the reproduction of the fungus.

DAY (W. R.) & PEACE (T. R.). **The experimental production and the diagnosis of frost injury on forest trees.**—*Oxford Forestry Mem.* 16, 60 pp., 10 pl., 5 graphs, 1934.

A full report is given of experiments on the artificial production of frost damage based on the exposure of small trees in pots to low temperatures produced in a refrigerating chamber. The evidence obtained showed that, in general, susceptibility to frost damage increases during spring, is at a maximum during summer, and decreases in the autumn till it reaches a minimum in winter. The critical temperatures at different times of the year for the species used are tabulated and expressed graphically. An intimate relation was established between the degree of susceptibility to frost injury and the extent to which the growing season of the plant coincides with that period of the year which is free or comparatively free from frosts. The susceptibility of particular parts of a plant to injury was found to be directly related to the manner in which growth is renewed in spring. Susceptibility to frost injury increases throughout the period of bud development and wood formation, with the result that first the buds or new shoots, then the older shoots bearing them, and subsequently the parts of the larger stems on which these shoots are situated become increasingly susceptible; this explains why so many frost cankers develop round a bud or shoot. Both lightning and lack of water cause the formation of zones of abnormal tissue that are identical in type to frost rings [the development of which is described in detail: *R.A.M.*, xi, p. 140], though sometimes different in detail.

A bibliography of 78 titles is appended.

MELIN (E.). **Activities of some fungi in the different horizons of forest duff, as measured by CO_2-evolution.**—*Svenska Skogsvårdsfören. Tidskr.*, xxxii, pp. 147–156, 4 graphs, 1934. [Swedish summary.]

The writer has previously shown (*Svenska Skogsvårdsfören. Tidskr.*, 1928) that in several North American forest types the carbon dioxide evolution is greater in the fermentation (F) than in the humified (H) layers (cf. H. Hesselman, *Medd. Statens Skogsförsoksanst.* 22, 23, 1926–7). During 1927–8 the writer examined in New Jersey the differences in the activities of micro-organisms in the F- and H-layers.

Pure cultures of the following fungi were used in the experiments: *Catharinea humicola* Nannf. (a cellulose-decomposing organism to be described later by J. A. Nannfeldt, isolated from the H-layer of a hardwood-spruce forest in Maine); *Mucor ramannianus* [*R.A.M.*, ix, p. 676], from the F-layer of a mixed conifer forest, Maine; *Cladosporium herbarum*, from the H-layer of a mixed conifer forest, Södermanland, Sweden; and *Trichoderma lignorum*

[ibid., xii, p. 534], from the F-layer of a spruce forest, Maine. The tests were carried out by Waksman's and Starkey's method [ibid., iii, p. 362], 10 gm. of dry matter of each of the humus samples being placed in culture flasks in which the water content was regulated to 100 per cent. of the dry matter. After autoclaving, 1 c.c. of a spore or humus suspension was added. The experiments were carried out at 25° C. and continued for 34 days, titration being done daily or on alternate days according to the amount of carbon dioxide evolved.

The activities of all the species under observation were greater in humus from the F- than in that from the H-layers, especially that of *C. herbarum*, which produced 59 times more carbon dioxide in the former than in the latter; the corresponding differences for *Catharinea humicola*, *M. ramannianus*, and *T. lignorum* were 20·6, 1·4, and 1·9 times, respectively.

FINDLAY (W. P. K.). **Studies in the physiology of wood-destroying fungi. I. The effect of nitrogen content upon the rate of decay of timber.**—*Ann. of Botany*, xlviii, 189, pp. 109–117, 1934.

When sample blocks of the seasoned heartwood of Sitka spruce (*Picea sitchensis*) oven-dried at 100° C. for 18 hours, were weighed, impregnated with a sterilized nitrogenous solution, re-dried, and exposed to attack by *Trametes serialis* [*R.A.M.*, xi, p. 342] in culture flasks for two or three months at 23°, and the loss in weight due to fungal decay determined as a percentage of the original dry weight (similar control blocks receiving identical treatment except that they were injected with sterilized water only), the results obtained [which are tabulated and discussed] showed that ammonium nitrate in low concentrations slightly increased the rate of decay. The largest increase occurred in blocks treated with 0·5 per cent., which lost 15·08 per cent. in weight, as compared with 10·62 per cent. in the controls. The addition of an organic source of nitrogen markedly stimulated fungal growth, increasing the loss in weight from 25·8 per cent. in the controls to 40·8 per cent. in the blocks treated with 1 per cent. peptone and to 37 per cent. in those treated with 1 per cent. asparagin.

Similar experiments in which beech blocks were exposed to attack by *Polystictus versicolor* gave less significant results, though in one instance pieces treated with 0·1 per cent. ammonium nitrate lost 19·36 per cent. weight as compared with 16·15 per cent. in the controls.

RUDGE (E. A.). **Studies in the decomposition of timber under industrial conditions. V. Dry rot.**—*Journ. Soc. Chem. Ind.*, liii, 6, pp. 38T–40T, 2 figs., 1934.

Practically all the serious dry rot in houses in Great Britain may be referred to *Merulius lacrymans* [*R.A.M.*, xii, pp. 68, 739], but in two cases investigated at the Technical College, Cardiff, there were no obvious signs of fungus growth. The first specimen was a portion of a wainscot skirting from the living room of a house. Decay (with dry rot symptoms) was detected two years ago, five years after the board was fixed against a black plaster

wall which was subsequently found to be extensively rotted. An analysis of the ash content indicated that the extent of decay was parallel with the degree of acquisition of calcium oxide. The presence of a lead priming coat on the outer surface of the wood failed to prevent the infiltration of inorganic matter from the wall, the plaster of which was found to consist of a lime-ash mixture.

The specimens in the second case were portions of deal joisting from beneath the floor of a modern dwelling house. The joists had been embedded to within a fraction of an inch of their top surfaces in inferior porous concrete, 9 in. thick, and resting on the subsoil foundations. After four years of service the entire flooring was removed in a state of collapse. Here again there was no apparent evidence of fungus growth. The wood was damp to the touch and the outer layers were friable. On analysis this wood was also found to be infiltrated by mineral matter, parallel in extent with the decay of the fibres. There was an abnormally high alkali chloride content, presumably derived from the sand of the concrete. Much of the infiltrated inorganic matter was shown to be associated with the cellulose.

These observations are considered to indicate that the fungous infection in dry rot is subsequent to an ionic intrusion into the woody tissues, and that the delayed or suppressed development of the fungus does not prevent the extensive spread of typical dry rot.

MEYER (A.). **Sur l'emploi des sels du dinitrophénol et du dinitrocrésol comme anticryptogamiques et parasiticides.** [On the use of dinitrophenol and dinitrocresol salts as fungicides and insecticides.]—*Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 43–46, 1934.

Attention is drawn to the toxicity to man and domestic animals of the dinitrophenol and dinitrocresol salts now coming into commercial use as fungicides and insecticides. Dinitro-orthro-cresol has long been employed in Germany in the preparation of the timber preservative antinonnin [*R.A.M.*, xi, p. 84], and the dinitrophenol salts are now being recommended there for similar purposes.

BLANK (I. H.). **Studies in the physiology of molds. IV. Moulding of chrome tanned skins.**—*Journ. Amer. Leather. Chem. Assoc.*, xxviii, 12, pp. 583–593, 1933.

The results [which are fully discussed and tabulated] of tests to determine the inhibitory action of a number of substances on the growth of *Aspergillus niger* in modified Czapek's broth showed that next to mercuric chloride, which inhibited growth at 1 in 40,000 to 1 in 50,000 and killed the spores at 1 in 10,000 to 1 in 20,000, o-nitrophenol was the most powerful agent in preventing growth (1 in 20,000 to 1 in 30,000) while p-nitrophenol was the best fungicide (1 in 7,000 to 1 in 8,000). The sodium salt of beta naphthol inhibits growth at 1 in 10,000 to 1 in 20,000 and destroys the spores at 1 in 2,000 to 1 in 3,000 and is stated to have been used in tanneries for some time.

The practical application of some of these substances to the prevention of mould growth on moist chrome-tanned skins, heavily inoculated with *Penicillium* spp., was also tested [cf. *R.A.M.*, xii, p. 94], and p-nitrophenol (1 in 5,000) was found to be the most useful for this purpose. It is an inexpensive solid material, easy to handle, soluble in water, and capable of permeating the skins in such a way as to inhibit mould growth for a period consistent with all tannery operations. P-nitrophenol is judged, on the basis of these experiments, to be as efficient as three times its weight of β-naphthol.

BUDDIN (W.). **The canker and the dry rot diseases of Swedes.**— *Min. of Agric. and Fish. Bull.* 74, 47 pp., 8 pl., 1934.

Ample evidence is stated to have been forthcoming, from the writer's investigations and those of his collaborators in Great Britain, that the species of *Phoma* constantly associated with the canker disease of swede plants grown for seed production is identical with the agent of dry rot in the root crop (*P. lingam*) [*R.A.M.*, xii, p. 481]. Seedling infection with the same fungus was observed on a few occasions, when it caused the shoot system to wither completely, so that its further course could not be followed, but pycnidia were formed under very moist conditions on the dead stems or cotyledons. The dirty white, light brown- or yellow-edged lesions formed by *P. lingam* on the leaf blades are somewhat inconspicuous, while the fungus has also been isolated from small, diseased areas on the bulblet or near the stem apex where they may readily escape notice. The obvious canker phase may, in fact, ultimately be of less importance in the spread of *P. lingam* than some of these inconspicuous forms of disease.

During these investigations Cunningham's observations on the occurrence of *P. lingam* on swede seed pods [ibid., vii, p. 70] were abundantly verified among the commercial plantings of Great Britain. When a seed lying beneath a lesion on the pod is invaded by the pathogen at a sufficiently early stage, the mycelium ramifies throughout the tissues and so prevents further development. Inoculation tests with spore suspensions of *P. lingam* showed that little progress is made by the disease on semi-mature pods.

Isolations from swede seed of fungi apparently agreeing with Cunningham's descriptions of supposed strains of *P. lingam* comprising his group I [loc. cit.] proved almost or entirely non-pathogenic on healthy roots. Only two of the strains received from New Zealand, belonging to Cunningham's group II, corresponded with the writer's conception of *P. lingam* and gave definite evidence of parasitism on swedes, the remaining five differing specifically from *P. lingam*. The results of tests by the germinator method on between 200 and 300 samples of commercial seed stocks showed that only about a quarter were infected by *P. lingam*, and those merely to the extent of 0·2 per cent. or less. It may be concluded, therefore, that infected individuals are extremely rare in most British commercial swede seed stocks, and unless some hitherto unknown factor should prove capable of stimulating and extending

this form of attack, it can for the present be disregarded for practical purposes.

Experiments at Reading showed that white mustard (*Brassica alba*), charlock (*B. arvensis*), and wild radish (*Raphanus raphanistrum*) are susceptible to *P. lingam*, while abundant spontaneous infection of *B. alba* var. *melanosperma* was observed in Dorset swede fields in 1930–1. No indication was observed in that county of insect transmission of the fungus as recorded by Cottier in New Zealand [ibid., xii, p. 134], and it is considered probable that infection is mainly disseminated by the weed hosts of the fungus, the débris of a previous diseased crop, or other like sources.

Promising results in the disinfection of artificially infected seeds were given by the following treatments: coating with granosan (the American Du Bay ceresan, containing 2 per cent. ethyl mercury chloride) [ibid., xii, p. 140] to the capacity of the seed, immersion in hot water (50° C.) for 25 minutes [ibid., vii, p. 758], and 30 minutes' immersion in 0·25 per cent. semesan at 46° preceded by several hours' soaking in water at room temperature. These methods reduced the incidence of infection from 44 and 18 per cent. in the germinator and soil pans, respectively, to 0 and 0·2 per cent. (granosan), 0·5 and 0 per cent. (hot water), and 1 and 0·2 per cent. (long hot semesan), respectively.

WALKER (J. C.). **Production of Cabbage seed free from Phoma lingam and Bacterium campestre.**—*Phytopath.*, xxiv, 2, pp. 158–160, 1934.

For the past ten years or more it has been observed that the cabbage seed crop in the Skagit Valley, Washington, and the crops raised from such seed in other localities are generally free from the agents of blackleg (*Phoma lingam*) and black rot (*Bacterium campestre*) [*Pseudomonas campestris*: *R.A.M.*, vii, p. 758; x, p. 151]. The absence of infection is attributed to the low rainfall in the district between May and September, eliminating the principal channel of dissemination by spattering drops. This conclusion was further strengthened by the virtual absence of the diseases in experimental plantings from heavily infested seed in the Skagit Valley. Of recent years a large proportion of commercial cabbage seed production in the United States has been transferred to the area in question, partly on account of its reputation for clean material.

PIERCE (W. H.). **Viroses of the Bean.**—*Phytopath.*, xxiv, 2, pp. 87–115, 5 figs., 1934.

In the course of studies at Wisconsin University on the resistance of beans (*Phaseolus vulgaris*) to common mosaic (bean virus 1), four other viruses were investigated on the bean, namely yellow bean mosaic virus (bean virus 2), lucerne mosaic virus (lucerne virus 2), ordinary tobacco mosaic virus (Johnson's tobacco virus 1), and tobacco ring spot virus [cf. *R.A.M.*, xii, pp. 414, 614, 741.] Of these only the two first were found on beans in nature.

Bean viruses 1 and 2 (the latter secured from a Red Valentine plant at Madison in 1931) both produced systemic infection, which

was much more virulent with virus 2. Lucerne virus 2, isolated from a strain of Turkestan lucerne showing symptoms of mottling and dwarfing apparently distinct from those caused by ordinary mosaic (lucerne virus 1) on this host [ibid., x, p. 388], and ordinary tobacco mosaic produced only local necrosis on beans, which developed both local and systemic infection, however, on inoculation with ring spot [ibid., viii, p. 139]. The symptoms on differential varieties are described.

The 24 bean varieties used in the tests [the results of which are fully discussed and tabulated] are grouped according to reaction to bean virus 1 as either susceptible, tolerant, or immune [ibid., xi, p. 561], and in general the same classification holds good for reaction to bean virus 2, although no variety showed immunity from this disease.

The thermal death points of bean viruses 1 and 2 were found to lie between 56° and 58° C. (ten minutes' exposure); of lucerne virus 2 between 62° and 64°; and of tobacco ring spot at 66° [ibid., xii, p. 108]. In ageing *in vitro* experiments bean viruses 1 and 2 lost their infectivity after 24 to 32 hours, the corresponding period for lucerne virus 2 and tobacco ring spot being 7 to 9 days. The infectivity of all these viruses was lost or reduced to a minimum at dilutions exceeding 1 in 1,000. Both the bean viruses were inactivated by 30 minutes' treatment with 50 per cent. alcohol [ibid., x, p. 284] and the lucerne virus with 75 per cent. At the latter concentration the tobacco ring spot virus was not inactivated when the inoculation tests were made on Refugee Green beans, but on Henderson Bush Lima (*P. lunatus*) no local lesions were produced after treatment at this strength. The following concentrations of 37 per cent. formaldehyde proved toxic: bean virus 1, 1 in 500, bean virus 2, 1 in 1,000, lucerne virus 2 and ring spot, 1 in 100 (1 in 200 for ring spot on Bush Lima beans).

Both bean viruses, 1 and 2, were transmitted by *Macrosiphum solanifolii* [*M. gei*] and *Illinoia* [*M.*] *pisi*, the latter transmitting also lucerne virus 2. No evidence of seed transmission of bean virus 2 was obtained, though bean virus 1 is seed borne.

Additional hosts of bean virus 1 [ibid., xi, p. 417] are *P. aureus*, *Lespedeza striata*, and spring vetch [*Vicia sativa*], while bean virus 2 was found to have the same host range except that it failed to infect some of the Bush Lima beans (*P. lunatus*), and *P. calcaratus*, and infected white sweet clover (*Melilotus alba*), soy-bean, white lupin (*Lupinus albus*), and crimson clover (*Trifolium incarnatum*) which are not susceptible to the common form. Systemic infection by lucerne virus 2 occurred on *Dolichos lablab*, *P. aureus*, lucerne, *M. alba*, *Trifolium* spp., peas, broad beans, soy-beans, *Petunia hybrida*, tobacco (*Nicotiana tabacum* and *N. glutinosa*), and some other hosts. Ordinary tobacco mosaic failed to infect any of the Leguminosae except *Phaseolus vulgaris*. Ring spot, however, caused systemic infection, usually followed by death, of white lupins, cowpeas, *Vigna sesquipedalis*, soy-beans, broad beans, *Vicia sativa*, *Stizolobium* sp., *P. aureus*, *P. calcaratus*, and many common bean varieties.

A summarized scheme for the identification of the five viruses on differential hosts is given in tabular form.

BÖNING (K.). **Die Fettfleckenkrankheit der Bohnen.** [The grease spot disease of Beans.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 11, pp. 265–269, 1 fig., 1934.

The grease spot disease of beans [*Phaseolus vulgaris*], caused by *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*, was first observed by the writer in a Munich market-garden in 1931, and by 1933 it had spread to several other establishments. The causal organism is believed to have been introduced on seed from southern Europe. The symptoms of the disease are described in popular terms and measures for its control discussed [*R.A.M.*, xi, p. 687].

LEHMAN (S. G.). **Frog-eye (Cercospora diazu Miura) on stems, pods, and seeds of Soybean, and the relation of these infections to recurrence of the disease.**—*Journ. Agric. Res.*, xlviii, 2, pp. 131–147, 2 pl., 1934.

The author states that since his first record of *Cercospora diazu* [*C. daizu*: *R.A.M.*, xi, p. 87] on the leaves of soy-beans in the United States [ibid., vii, p. 760 *et passim*], the fungus has been frequently observed in the field on the stems, pods, and seeds of this host, and he gives a detailed account of the lesions formed on each of these organs. On the stems the parasite is chiefly confined to the cortex, and injury to the phloem and cambium, which are less often invaded, is usually due to the diffusion of toxic substances from the necrotic cortex. On the pods the lesions are usually round, somewhat sunken, 1 to 4 mm. in diameter, at first brown or reddish-brown but when dry light brown with a dark brown margin. The mycelium penetrates the thin white membrane lining the pod and closely invests the seeds, portions of the diseased membrane often adhering to the seed coat; no definite lesion or discoloration is produced on the latter, but there is often a slight depression and a lack of the smoothness and lustre characteristic of the coats of healthy seeds. In the great majority of infected seeds the growth of the fungus is superficial and is easily controlled by seed disinfectants. Infection of the embryo occurs rarely, if at all. In potato agar test tube cultures the fungus remained viable for about 17 months.

The infection was shown to be carried over winter on diseased leaves and stems left in the field from the previous crop, but ploughing-in of infected stubble in the autumn was not found to be a practicable method of preventing or even appreciably retarding the development of the disease the next season. Further territorial spread of the disease may be prevented by the use of healthy seed.

NEUWIRTH (F.). **Ökologie der aufgehenden Rübe mit Berücksichtigung ihrer Krankheiten. Die fakultativen Parasiten, ihr gegenseitiges Verhältnis und ihre Beziehung zur Wirtspflanze. II. Teil.** [The ecology of the germinating Beet with reference to its diseases. The facultative parasites, their mutual relationship, and their connexion with the host. Part II.]—*Zeitschr. für Zuckerind.*, lviii, 21, pp. 153–160, 1934.

The writer discusses the mutual relationships of the facultative parasites associated with root rot of beets in Czecho-Slovakia in

the light of his own observations and those of other workers [cf. *R.A.M.*, xiii, p. 347]. Four groups of plants were differentiated in the field on the basis of macroscopic symptoms, viz., (1) those with a strangulated appearance or a brown to black discoloration of the hypocotyl; (2) those with a blackening of petioles and bases of the cotyledonary leaves; (3) those with a diseased basal portion of the root; and (4) those with apical blackening and desiccation of the cotyledonary leaves. In 1926 most of the 200 plants examined contained hyphae and oospores of *Pythium* sp., whereas in 1927 *Phoma betae* predominated in the cultures from 250 plants. *Pythium* sp. occurred chiefly on the seeds destroyed in the soil before emergence, *Phoma betae* being rare at this stage. Physiological injury to beets in the incipient phases of vegetation induced similar symptoms to those caused by fungi, while the effects of root rot were further simulated by plants exposed in sterile cultures to adverse external conditions. In such cases the root tips are chiefly affected, but in older plants the hypocotyl and adjacent basal parts may also be involved.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Alkali scorch of Bermuda Onions.**—*Amer. Journ. of Botany*, xxi, 2, pp. 69–71, 1 fig., 1934.

Appreciable losses have resulted during the shipping and storage of Texas-grown, white Bermuda onions from a condition termed 'alkali scorch', apparently associated with the heavy impregnation of the jute packing sacks with alkaline materials. The trouble was experimentally reproduced by placing sound onion bulbs in such sacks. Affected onions may be recognized by the irregular, brown to dark reddish spots on the outer scales, superficial at first but gradually penetrating the tissues and ultimately involving the entire bulb in desiccation and mummification.

WAKSMAN (S. A.) & RENEGER (C. A.). **Artificial manure for Mushroom production.**—*Mycologia*, xxvi, 1, pp. 38–45, 1 graph, 1934.

An ideal mixture for the preparation of a mushroom [*Psalliota campestris*] compost was shown by the writers' investigations at the New Jersey Agricultural Experiment Station [*R.A.M.*, xii, p. 137] to be furnished by a certain balance between cereal straw and green plant material either freshly harvested or dried. The spawn made the best growth in a small-scale experiment on a mixture of 60 per cent. straw and 40 per cent. dry lucerne hay, the compost being properly watered and allowed to decompose for 44 days, while the largest yield was obtained on 70 per cent. straw plus 30 per cent. tobacco stems similarly treated. Both these artificial composts were superior to the commonly-used horse manure as mushroom bed material, when made into beds and kept at 61° C. for a week before sowing the spawn.

MARTINOFF (S. I.). Мозайка или втърничване на Лозата (Предварително съобщение). [Mosaic or Reisigkrankheit of the Vine. (Preliminary communication).]—Reprinted from *Земледѣлие* (*Agriculture*), Sofia, xxxviii, 2, 6 pp., 1934. [English summary.]

As a result of his official investigation in 1932–3 in various parts

of Bulgaria of a serious disease of the vine (first prominent in 1930 and now spreading in a threatening fashion and causing considerable losses in young plantations), the author states that the trouble is a virus disease, apparently closely related to vine mosaic in Czecho-Slovakia [*R.A.M.*, xiii, p. 421]. Careful examination of affected vineyards showed the presence in the same field and not infrequently on the same stock of various combinations of different symptoms characteristic of diseases which have been described in literature under the names of mal nero [ibid., ix, p. 504], reisigkrankheit, roncet, court-noué [ibid., xiii, pp. 353, 422], rougeau, brunissure, apoplexie [cf. ibid., x, p. 78], &c., and which the author considers to be but different manifestations of the virus trouble, either due to varietal responses of the host or to ecological conditions. The diversity of the symptoms [which are briefly described as affecting the various organs] would indicate, however, the probability that the virus is not a single entity but a mixture of more than one component.

From a study of the relevant literature, the author concludes that the disease is very widely distributed over the whole world, and that it is readily transmissible by cuttings, grafts, pruning tools, and the like, and probably also by insects, among which the possibility of the two forms of *Phylloxera* [*P. vastatrix* f. *gallicola* and f. *radicicola*) acting as vectors is not excluded. He considers that a very large proportion of the existing vine stocks are infected, the problem being complicated by the fact that some varieties appear to carry the virus in a latent condition. In his opinion the disease calls for control measures planned on the same lines as those for the control of virus diseases of potatoes or sugarcane.

MARCHAL (É). **Observations et recherches effectués à la Station de Phytopathologie de l'Etat pendant l'année 1933.** (Observations and researches carried out at the State Phytopathological Station during the year 1933.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 2, pp. 97–106, 1934. [Flemish, German, and English summaries.]

This report contains *inter alia* the following items of interest. In 1933, sugar beets in Belgium were widely and severely attacked by mosaic [*R.A.M.*, xii, pp. 263, 673], while mangolds suffered heavy losses, especially in the late crop. The bacterial disease of tobacco resembling wildfire [*Bacterium tabacum*: ibid., xiii, p. 190] was less prevalent than in previous years, though tobacco mosaic was commoner; a few isolated cases of vein-banding and ring spot were noted. Onions were attacked by *Urocystis cepulae*. Witloof chicory [*Cichorium intybus*] showed a bacterial root rot thought to be due possibly to *Bacillus carotovorus*. Beans [*Vicia faba*] developed a bacteriosis resembling chocolate spot (*B. lathyri*) [ibid., xiii, p. 206]. La Hestre dahlias were attacked by mosaic [see below, p. 516] and ring spot [ibid., xii, p. 697], while lilies were affected by a bacteriosis characterized by brown, slightly depressed spots on the leaves and dark striae on the axes, the symptoms closely resembling those of *B. lilii* Uyeda.

England and Wales: new and interesting phytopathological records for the year 1933.—*Internat. Bull. of Plant Protect.*, viii, 3, p. 51, 1934.

The following fungi are believed to have occurred for the first time on the hosts in question in England and Wales during 1933: *Phytophthora cryptogea* [*R.A.M.*, ix, pp. 272, 700] causing foot rot of *Zinnia* [*elegans*]; *Pleospora herbarum* and *Marssonina panattoniana* [ibid., ix, p. 224] on endive; *Helicobasidium purpureum* on chicory; *Septoria gladioli* [ibid., xiii, p. 461] on imported crocus corms; *Thielaviopsis basicola* on *Gloxinia* [*speciosa*] corms; and *Sclerotium tuliparum* [ibid., xi, p. 423] on *Narcissus* bulbs.

Christoff (A.). Нѣколко нови растителни болести за България. II-и Приносъ). [Some plant diseases new to Bulgaria. (2nd contribution).]—*Bull. Soc. Bot. de Bulgarie*, vi, pp. 37–48, 1934. [English summary.]

In this second list of new records for Bulgaria of plant parasitic bacteria and fungi [*R.A.M.*, xi, p. 475], the author gives notes on 22 species of fungi and two of bacteria, including *Phytomonas* [*Bacterium*] *rhizogenes* [ibid., xiii, p. 450] which he isolated from typical hairy root of apple in the State nursery at Kazanlyk. *Diaporthe perniciosa* [see below, pp. 524, 525] was found causing a trunk rot on cherry trees in the neighbourhood of Varna, and was also isolated from the discoloured wood of plums in Vidin. *Stereum purpureum* was found attacking apples, almonds, pears, bird cherries (*Prunus avium*), and a few plums in several localities. *Puccinia tulipae* Schroeter was seen on *Tulipa orientalis* var. *rhodopea*, producing elongated, erumpent, black sori. The teleutospores are brown, one-septate, warty, and 37 to 48 by 27·7 to 35·3 μ in diameter. *Phyllosticta* [*Sphaceloma*] *rosarum* [ibid., xii, p. 96] was found on various rose varieties. *Ascochyta piricola* Sacc. was isolated from an apple cutting from a tree affected with a trunk rot. *Hendersonia piricola* [ibid., vii, p. 700] was found on pear. *Pestalozzia malorum* Elenk. & Ohl. occurs frequently on apple seedlings and cuttings; it only differs in the size of its spores (17·5 to 23 by 6 to 7·5 μ) from the description given in the Russian journal, *Plant Diseases*, in 1912 (pp. 94–100), where it was stated to cause a leaf spot of apples. *Fusarium scirpi* var. *caudatum* was observed on the opium poppy (*Papaver somniferum*) in the neighbourhood of Sofia; observations and experimental data indicate that the fungus is a semi-parasite, capable of attacking all the aerial organs of the poppy, including the seed capsules and the seed. Seedlings raised from infected seed suffer severely from a blight caused by the fungus, which was re-isolated from the killed plants. The fungus was cultured on different media, and an account is given of its cultural and morphological characters.

The paper terminates with an annotated list of 28 species of fungi which were found on new hosts in Bulgaria.

Uppal (B. N.). **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1932-33.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1932-33*, pp. 171–175, 1934.

During the period under review mildew [*Erysiphe polygoni*:

R.A.M., xii, p. 393] of cumin [*Cuminum cyminum*] in one locality in the Bombay Presidency was completely controlled by the application of 20 lb. of sulphur per acre.

Definite proof was obtained that one application of sulphur (20 lb. per acre) made about flowering time, i.e. 40 to 45 days after sowing, effects complete control of powdery mildew of peas [*E. polygoni*: ibid., xii, p. 551]; it was demonstrated experimentally that the fungus lives from year to year as dormant mycelium in diseased seed. The optimum temperature for the germination of the conidia lies between 22° and 24° C., conidial germination not taking place above 30° or below 10°.

Inoculation experiments confirmed the view that the *Alternaria* causing cumin blight [loc. cit.] is confined to this host. The spores are dark brown, stout, often arranged in chains of 2 to 6, and measure 13 to 62 by 6·9 to 24 μ. They have 1 to 8 (usually 3) longitudinal septa, and 1 to 5 (usually 1 or 2) transverse ones.

Copodust [ibid., xii, p. 325] applied every month or two at 15 lb. per treatment per acre gave very promising results in the control of fig rust [*Cerotelium fici*: loc. cit.], while in another locality complete control was secured by five applications of sulphur each of about 24 lb. per acre.

Macrophomina phaseoli was isolated from sorghum, papaw, castor, eggplant, and bananas. The fungus produced pycnidia on sorghum seedlings grown in Roux tubes; when the papaw strain was grown on potato dextrose agar pycnidia also developed.

SHEPHERD (E. F. S.). **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for 1932*, pp. 32–38, 1933. [Received May, 1934.]

In a test carried out in Mauritius to ascertain whether susceptibility or resistance to gummosis (*Bacterium vascularum*) [*R.A.M.*, xii, p. 553] is transmitted to the progeny by certain sugar-cane crosses there was on the whole no consistency in resistance among the progeny of any particular cross of noble canes, but in the progeny of crosses where wild 'blood' [ibid., xi, p. 266; xii, p. 787] had been introduced there was a consistently high resistance; of 16 different seedlings bred prior to 1931 six were highly resistant to immune.

Fifteen months after a plot had been laid out with apparently healthy cuttings of the susceptible P.O.J. 2878 cane taken from a field heavily infected with 'fourth disease' [ibid., xiii, p. 325] no symptoms had appeared on the shoots, nor did they develop in shoots inoculated with a suspension of diseased leaf tissue in water.

A *Pythium* isolated from the roots of sugar-cane seedlings was identified at the Imperial Mycological Institute as, probably, *P. graminicolum* Subram. [ibid., xii, p. 246], apparently identical with Carpenter's cane root *Pythium* in Hawaii. A *Moniliopsis* isolated from the roots of sugar-cane seedlings showed the hyphal characters of strains of the *Corticium solani* group, but no tendency to form sclerotia and no dark coloration.

The chief cause of loss in tobacco was black shank due to a strain of *Phytophthora parasitica* [ibid., xii, p. 554]; in the summer crop loss was reduced by abandoning the practice of apply-

ing pen manure to tobacco nursery beds and fields. A *Phytophthora* associated with a collar rot of *Antirrhinum* sp. was identified by Ashby as a strain of *P. parasitica*, as was another causing a fruit rot of *Luffa acutangula*.

A fungus isolated from a coco-nut tree affected with bud rot was identified, also by Ashby, as a typical strain of *P. palmivora* in the rubber group; it belongs to the same group as the coco-nut *Phytophthora* strains in Jamaica, Porto Rico, and the Philippines [ibid., viii, p. 527].

From a disease of maize characterized by a white striping of the leaves and gum exudation from the stem a pathogenic bacterium was isolated differing from all pathogens hitherto described from maize.

A wilt of zinnias and dahlias was apparently due to *Bacterium solanacearum*; the exudate from the roots of affected zinnias when inoculated into young tobacco plants killed them.

Plant pathology. [*ex* Experiment Station Summary Report of Progress, 1933.]—*Maine Agric. Exper. Stat. Bull.* 369, pp. 558–581, 3 figs., 1933. [Received May, 1934.]

In the part of this report dealing with degeneration diseases of Green Mountain potatoes it is stated that the reduction in yield due to these in north-eastern Maine in 1932 ranged from 12 per cent. in the case of mild mosaic to 92 per cent. in that of leaf roll [*R.A.M.*, xii, p. 612]. In the vicinity of Presque Isle rugose mosaic, spindle tuber, and leaf roll spread much less readily than mild mosaic; healthy Green Mountain potatoes grown in 1932 next to others affected with mild mosaic showed 46 per cent. disease when grown in 1933, and even those 14 rows (40 ft.) away gave 12 per cent., whereas healthy rows adjacent to potatoes affected with rugose mosaic developed only 12 per cent. disease in the progeny a year later. In 1932 spindle tuber did not spread beyond the first row, in which only 7 per cent. of the plants became attacked. Mild mosaic (manifested on Green Mountain potatoes as irregular, light green spots, and slight wrinkling) was ascertained to consist of two components, one latent and masked in the Green Mountain and many other varieties, the other manifested on a seedling potato resistant to the former and on a latent-free Green Mountain seedling as light green, slightly rugose leaves. The second component was separated from the latent component by means of aphids, which transmitted the former only.

Phoma tuberosa [ibid., vii, p. 425], *Alternaria solani*, and a *Fusarium* were isolated from lesions in stored potatoes, all three being present on most of the samples, indicating that their distribution is general. Both the foliage and tubers of Foster Seedling potatoes were highly resistant to late blight [*Phytophthora infestans*]. The number of growers in Aroostook County co-operating in the potato spray service [mainly against late blight] increased from 81 in 1931 to 2,410 in 1933.

Notes are also given on comparative tests [against potato late blight] with Bordeaux mixture and home-made colloidal copper, as well as home-made and commercial copper-lime and other dusts; and on seed-potato steeping experiments against *Rhizoctonia*

[*Corticium solani*] in which the standard mercuric chloride treatment was compared with acid mercuric chloride, various modifications of it, and with mixtures containing mercuric chloride and potassium iodide. The acid mercuric chloride gives good results but sometimes causes pitting of the eyes. In spraying tests on McIntosh apples lime-sulphur reduced scab [*Venturia inaequalis*] but caused leaf-burn, while lead arsenate applied after the calyx application increased leaf-burn considerably. Slight but significant increases in scab occurred when sulphur dust was substituted for lime-sulphur and when applications of the latter were discontinued after the calyx application.

The most prevalent and destructive disease of blueberries [*Vaccinium* spp.] was mildew [*Microsphaera alni* var. *vaccinii*: ibid., x, p. 532]. Low-bush blueberries (chiefly *V. pennsylvanicum*) affected with witches' broom rust [*Calyptospora columnaris*: loc. cit.] averaged 33 per cent. less yield than healthy ones.

OSMUN (A. V.). **Department of Botany.**—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the year ending November 30, 1933* (*Bull.* 305), pp. 17–22, 1934.

The following items of phytopathological interest occur in this report, to which W. L. Doran and E. F. Guba contribute. Soil in which cucumbers were growing (in crocks) was watered with solutions of copper sulphate at concentrations from 0·29 to 1 gm. per gall. frequently enough to keep the soil at or near the optimum moisture content for growth, from 30th June, when the plants were ten days old, to 11th September, inoculations with *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [*R.A.M.*, xii, p. 493] being made on 3rd September. None of the treatments increased resistance and all were injurious to growth.

Soil 3 in. deep in flats in which lettuce seedlings were growing was similarly watered with copper sulphate solution at 0·43, 0·57, 0·86, and 1 gm. per gall. One month after the beginning of the treatment, all the plants were inoculated with *Bremia lactucae* [ibid., xii, p. 494]. Tipburn [ibid., xii, pp. 196, 611] was severe on the lettuces given water only, but absent from those treated with copper sulphate, which also showed less downy mildew than the controls. Where 1 per cent. copper sulphate was given there was very little downy mildew, but the lettuces were much injured; the weaker solutions also caused some injury. The protection against the disease did not persist when the plants were planted out in the field.

The red currant tomato (*Lycopersicum pimpinellifolium*) [ibid., xii, p. 120], which is immune from leaf mould (*Cladosporium fulvum*) [ibid., xii, pp. 249, 251], was successfully hybridized with the Success, Belmont, and Break o' Day cultivated varieties. Of tomato crosses grown in the field the following showed most resistance to leaf mould in the F_2 generation: Bewley II (Stonnor's M.P. × Up-to-Date) with Norduke, Bewley IV (E.S. 1 × Up-to-Date) with Norduke, Bewley I (Riverside × Up-to-Date) with Norduke, Norduke with Stirling Castle, Up-to-Date with Norduke, and Maincrop with Norduke. Very good control of leaf mould was given by a spray consisting of 1 oz. salicylanilide paste

(shirlan HB) and 2½ oz. sulphonated oil spreader (agral I) [ibid., xii, p. 403]. The Sulphurator patent sulphur-vaporizer [ibid., xii, p. 733], after certain improvements, gave promise of replacing other methods of applying sulphur under glass.

Strawberry gold leaf [ibid., xii, p. 494; xiii, p. 41] did not spread from diseased to healthy adjacent rows. Vertical unions of the root crown of diseased and healthy stock did not result in spread to the healthy half or its daughter plants in the first cropping season.

Most of the damping-off of herbaceous ornamental plants observed was caused by species of *Pythium*, though *Rhizoctonia* was occasionally present. Soil applications of ammonium hydroxide (applied in water two weeks before seeding at the rate of 2 qts. per sq. ft.) 1 in 60, 1 in 50, 1 in 40, and 1 in 30 gave, respectively, no control and no injury to the plants, fair control and no injury, good control but with injury to *Alyssum saxatile* and *Lobularia maritima*, and good control but toxic effect on *A. saxatile*, *L. maritima*, sweet pea, *Scabiosa atropurpurea*, beet, and cucumber. Calcium cyanamide at the rate of 10 gm. per sq. ft. gave good control, benefited *Salpiglossis* and *Campanula medium*, and was harmless to *Calendula*, sweet pea, and *L. maritima*; used at 14 gm. per sq. ft. it gave good control, was harmless to *A. rostratum*, beet, and cucumber, but was toxic to *Scabiosa*.

Ocean Spray, My Love, Satellite Woburn, and Golden Wonder carnations were resistant to blight (*Alternaria dianthi*) [ibid., xi, p. 497].

BOURIQUET (G.). **Rapport phytopathologique sur un voyage d'études effectué à la Réunion en octobre 1932.** [Phytopathological report on a voyage of investigation made to Réunion in October, 1932.]—*Rev. Agric. de l'Île de la Réunion*, N.S., xxxix, pp. 11–20, 2 pl., 1934.

These notes on plant diseases observed during a brief visit to Réunion in 1932 contain various items of phytopathological interest, most of which have already been noticed from another source [*R.A.M.*, xii, p. 680].

ARNAUDI (C.) & VENTURELLI (G.). **L'azione del radio sui tumori vegetali.** [The action of radium on plant tumours.]—*Riv. di Biol.*, xvi, 1, pp. 61–79, 1 pl., 1934.

Full details are given of irradiation experiments on *Ricinus communis* plants inoculated with *Bacterium tumefaciens*, which clearly demonstrated the therapeutic effects both of radio-activated water containing 1,600 units Mache of emanations equivalent to 640 microcuries, and of direct exposure to radium filtration through 5 mm. of lead and 1·5 cm. of Columbia paste [cf. *R.A.M.*, xii, p. 680].

GOSSET (A.), MAGROU (J.), & TCHAKIRIAN (A.). **Action de divers éléments sur les tumeurs bactériennes du Pelargonium.** [The action of various elements on the bacterial tumours of *Pelargonium*.]—*Comptes rendus Acad. des Sciences*, cxcviii, 12, pp. 1097–1100, 1934.

Germanium oxide, molybdenic acid, cerium borate and oxide,

stannous and zirconium tartrates, and aluminium chloride, introduced in appropriate concentrations into the galls on *Pelargonium zonale* caused by *Bacterium tumefaciens* [*R.A.M.*, xiii, p. 16], induced the rapid and sometimes permanent necrosis of the neoplasms. The only one of these elements exercising a selective action on the galls when injected into the vascular system of the plants was germanium, the oxide of which produced temporary necrosis in a few days.

KOSTOFF (D.) & KENDALL (J.). **Studies on plant tumors and polyploidy produced by bacteria and other agents.**—*Arch. für Mikrobiol.*, iv, 4, pp. 487–508, 15 figs., 1933.

Following up previous studies [*R.A.M.*, xii, p. 59], the writers present comparative morphological, histological, cytological, and physiological observations on the tumours caused by inoculation with *Bacterium tumefaciens* on *Ricinus communis*, *Pelargonium zonale*, tomato, beet, and tobacco (*Nicotiana triplex* and *N. tabacum* × *N. glauca*), spontaneous outgrowths on various tobacco hybrids, and neoplasms induced by the application of certain chemicals (lactic, formic, and amber acids, asparagin, zinc nitrate, ammonium carbonate, arsenic oxide, urea, formalin, and uranium oxide), *Ricinus* extract, aniline water, and tar water [ibid., x, pp. 200, 399]. Close structural parallels were found to exist between the three types of proliferation. The production of polypoid shoots under the influence of *Bact. tumefaciens* suggests a potentially significant rôle for this widespread organism in the evolutionary process.

A bibliography of 50 titles is appended.

GREANEY (F. J.). **Studies in cereal diseases. XI. The prevention of cereal rusts by the use of fungicidal dusts.**—*Canada Dept. of Agric. Bull.* 171, N.S., 90 pp., 23 figs., 7 graphs, 1934.

Studies [which are fully described and the results of which are tabulated and expressed graphically] at the Dominion Rust Research Laboratory, Winnipeg, of the action of fungicidal dusts on the aecidiospores of *Puccinia graminis tritici* and *P. graminis agrostidis*, and the uredospores of *P. graminis tritici*, *P. graminis avenae*, *P. triticina*, *P. coronata avenae* [*P. lolii*], *P. anomala*, and *P. glumarum* [*R.A.M.*, xi, p. 286; xii, pp. 271, 426] demonstrated that both copper and sulphur dusts were highly toxic to the germinating spores. When tested on the growing plant in the greenhouse, however, sulphur dusts were much more effective than copper dusts, which injured the plants when applied in the quantities necessary for efficient control. The sulphur dusts acted as protective agents, preventing infection when applied before inoculation; their effectiveness was, however, reduced in proportion to the time that elapsed between application and inoculation. Once a plant was infected, subsequent applications of sulphur served only to prevent further infections. The presence of abundant moisture at or after the time of inoculation greatly reduced the efficiency of the sulphur.

In field experiments conducted each year well-timed, properly made applications of sulphur dust prevented rust and other leaf

and stem diseases of cereals, including *Gibberella saubinetii* and bacterial black chaff (not positively identified with *Bacterium translucens* var. *undulosum* [ibid., xii, pp. 7, 13] but identical with it in general symptoms) to a marked degree, practical and effective dusting schedules being drawn up against *P. graminis* on wheat and oats for use in small plots and large fields. Aeroplane dusting [ibid., xi, p. 287] was effective but uneconomic. Taking the tests as a whole, finely divided sulphur gave the best rust control, fungicidal efficacy increasing in proportion to the fineness of the particles; ordinary pure sulphur of 300-mesh fineness gave very satisfactory results. The best control was obtained when the initial applications were made when stem rust first appeared, i.e., when the wheat was in the late 'boot' or 'early heading' stage. Subsequent applications were made over a period of four to six weeks, while the plants remained in a susceptible stage of growth. The most advantageous times were early morning, late evening, and immediately after rain. The effect of the sulphur on the amount of infection and yield was greatest with heavy, frequent applications, and least with light, infrequent ones. For black rust of wheat and oats the most economical rate was 30 lb. per acre per application. When infection was severe the most satisfactory interval between the applications was four days, but when light infection prevailed control resulted from applications made at seven-day intervals at the rate of 15 lb. per acre. Relatively light applications at close intervals gave the best results in preventing leaf rust (*P. triticina*) and some of the minor leaf and stem diseases of wheat and also *P. lolii* on oats. Heavy soil applications of sulphur had no apparent fertilizing effect.

Data presented in the form of correlation coefficients and regression equations show that uniform increases in rust resulted in uniform reduction in yield; at Winnipeg in 1930 each 10 per cent. increment of wheat black rust reduced the yield by 8·2 per cent. Calculated on this basis the total loss in yield that year for black rust of wheat and oats, respectively, was 73 and 49 per cent.

A bibliography of 107 titles is appended.

MEHTA (K. C.). **Rusts of Wheat and Barley in India. A study of their annual recurrence, life-histories and physiologic forms.**—*Indian Journ. Agric. Sci.*, iii, 6, pp. 939-962, 1 pl., 1 map, 1933. [Received June, 1934.]

A report, supplemented by some general observations, tables, and charts, is given of the progress since 1930 of investigations on various aspects of the problems connected with black rust of wheat and barley (*Puccinia graminis*), brown rust of wheat (*P. triticina*), and yellow rust of barley (*P. glumarum*) in India [*R.A.M.*, x, p. 710].

Berberis vulgaris, raised from seed collected in England, was successfully infected by black rust sporidia in India, and the resulting aecidiospores infected wheat and barley. The uredospores of *P. graminis* and of *P. triticina*, which are probably disseminated to the plains from relatively low altitudes, cause outbreaks of rust on the new crops fairly early in the season (November and December). Both have recently been found to pass the summer at

altitudes of 3,500 to 4,000 ft. in the Kumaon Himalaya. Hitherto only four physiologic forms of *P. graminis* (XV, XL, XLI, and LXXV) and two of *P. triticina* (X and a new one) [ibid., xii, pp. 556, 619, *et passim*] have been found in India.

DODOFF (D. N.). Физиологически раси на черната ръжда по Пшеницата (**P. graminis tritici**) въ България. (**I** Приносъ). [Physiologic forms of the Wheat stem rust (*P. graminis tritici*) in Bulgaria. (1st Contribution).]—*Yearbook Univ. of Sofia, Fac. of Agric.*, xii, pp. 334–365, 7 figs., 1934. [English summary.]

As a result of his study [details of which are given] of the behaviour on Stakman's and Levine's differential wheat varieties [*R.A.M.*, ii, p. 158] of 69 collections of wheat stem [black] rust (*Puccinia graminis tritici*), gathered in 1931 and 1932 from various parts of Bulgaria, the author established the occurrence in that country of physiologic forms 17, 24, 34, 40, 116, and 119 of the rust. He also found two new forms, 129 and 130, the reaction of which on the differential varieties is indicated, and each of which was obtained only once. It is pointed out that this is the first record in nature of physiologic forms 116 [but see ibid., xiii, p. 361] and 119, which had been artificially produced by crossing in Canada [ibid., x, p. 16; xii, p. 14]. Of these, form 116 was prevalent, together with form 40, both in 1931 and in 1932, while form 119, as well as forms 17 and 24, were only found once each. Form 34 was isolated once in 1931 and six times in 1932. Notes are given on the distribution of these forms in other continents.

In describing the experiments, it is stated that most of the work was done in the months from September to November, inclusive, and from February to the beginning of May, in order to obviate the unfavourable effect of ecological factors, especially that of temperature and light, on the normal development of the artificially induced rust epidemics.

JOHNSON (T.), NEWTON (MARGARET), & BROWN (A. M.). **Further studies of the inheritance of spore colour and pathogenicity in crosses between physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, xiv, 7, pp. 360–373, 4 diags., 1934.

Continuing their investigation of the inheritance of colour and pathogenicity in crosses between physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, x, p. 169], the authors give a detailed account of experiments in which they studied this inheritance in a number of selfed F_1 hybrid forms, and the F_2 cultures from them, of crosses between physiologic forms of the rust. The results [some of which are presented in the form of diagrams] showed the presence in the F_2 progeny of a selfed F_1 hybrid form, owing to segregation and subsequent recombination of the factors governing pathogenicity, of several different physiologic forms, frequently including the original parental forms. The fact that the number of such physiologic forms in the F_2 population was definitely greater in some crosses than in others would indicate that the same number of factors is not involved in all the crosses. It was further shown that the majority of the F_2 cultures of the several crosses

that were selfed in the F_1 were heterozygous for pathogenicity, and that the progeny of these F_2 heterozygous cultures usually contained fewer physiologic forms than that of a selfed F_1 hybrid form.

The assumption that the inheritance of pathogenicity in *P. g. tritici* is influenced by the cytoplasm of the parent forms found apparent support in the fact that the pathogenic differences noticed in a previous communication [ibid., xii, p. 14] between F_1 hybrid forms originating from opposite sides of reciprocal crosses persisted in all the individuals of the F_2 and F_3 generations, indicating that these differences are not subject to segregation and recombination as are other pathogenic characters in the same crosses.

While the inheritance of uredospore colour has not been finally studied, the indications are that it is Mendelian in character. The factors for orange and greyish-brown are, in a sense, complementary factors, and the inheritance appears to be analogous to the well-known 'rose and pea comb' type of inheritance in fowls. Red spore colour appears to be due to the presence of two dominant factors for orange and greyish-brown, while white spore colour may be explained by the presence of their recessive allelomorphs.

KLEMM (M.). **Ernteschäden durch Schwarzrost in Deutschland im Jahre 1932.** [Crop damage from black rust in Germany in the year 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 2, pp. 9-11, 1 map, 1934.

Among the German provinces most seriously affected by the 1932 epidemic of black rust of cereals [*Puccinia graminis*: *R.A.M.*, xii, p. 149] were East Prussia and Silesia. The total loss from this source in the former province was estimated by the Königsberg plant protection head-quarters at M. 18,200,000, while in West Prussia, where a record harvest was expected, the wheat and oats yields amounted to only 30 to 60 per cent. of the normal; in the Pillkallen district alone the losses approximated to M. 4,250,000. In Lower Silesia severe damage from rust occurred over an area of 34,000 hect., and in two districts the yields were reduced by 40 to 50 per cent., these being the heaviest losses on record for some thirty years.

NEILL (J. C.). **The control of stinking smut of Wheat. Experiments on seed treatment with various dusts.**—*New Zealand Journ. of Agric.*, xlviii, 3, pp. 170-171, 1934.

The results [given in a table] of experiments in 1933 at the Plant Research Station, Palmerston North, for the purpose of comparing the relative efficacy of a number of fungicidal dusts in the control of wheat bunt [*Tilletia caries* and *T. foetens*] by seed-grain treatment, showed that ceresan new alone completely controlled the disease in the progeny of naturally heavily infected (56 per cent. smutted plants) Solid Straw Tuscan wheat, ceresan being nearly as effective. Among the copper compounds tested, smutol (copper oxychloride) [*R.A.M.*, x, p. 781] gave the best results, followed closely by copper carbonate; various samples of the latter were effective in the order of their relative copper contents. In the progeny of the artificially infected Jumbuck wheat (95

cent. smutted), bunt was entirely controlled by all the dusts, with the exception of agrosan G, semesan, and the copper carbonate with the lowest copper content (18 per cent.).

NEILL (J. C.). **Effect of excess of disinfectant dusts on the field germination of seed Wheat.**—*New Zealand Journ. of Agric.*, xlviii, 3, p. 174, 1934.

The experiments briefly outlined in this note showed that copper carbonate or agrosan G dust in excess of the dose prescribed for wheat seed-grain disinfection [e.g., against *Tilletia caries* and *T. foetens*: see preceding abstract] had little or no effect on germination in the field, whether sown with or without superphosphate. Excess ceresan practically inhibited germination of the wheat under the same conditions, while ceresan new in excess caused severe injury in the absence of the fertilizer but gave slightly better germination than untreated seed when sown with superphosphate.

RUSSELL (R. C.). **Studies in cereal diseases. X. Studies of take-all and its causal organism, Ophiobolus graminis Sacc.**—*Canada Dept. of Agric. Bull.* 170, N.S., 64 pp., 18 figs., 1934.

In this detailed account of his investigations into take-all of wheat (*Ophiobolus graminis*) [*R.A.M.*, xii, pp. 621, 684; xiii, p. 433] in western Canada the author states that penetration of the epidermal cells of the coleoptile appears to be largely mechanical, although the staining reaction of the host cell wall is changed round the point of entry, possibly through the action of an enzyme or toxin secreted by the fungus. Near the points of penetration the cell walls usually swell, producing the 'lignitubers' of Fellows [ibid., viii, p. 370], the penetration pegs formed at the tips of the hyphal branches being only about one-fifth of the diameter of the external hyphae. When the hypha has entered an epidermal cell it often turns at right angles and branches. The fungus then passes into the cortex, apparently destroying the parenchymatous tissue much sooner than the fibrovascular. Infection appears to be limited to the underground parts and the base of the stem for a short distance above the ground.

Host range studies showed that most of the cereals and cultivated grasses as well as many wild grasses in western Canada are susceptible, but oats, maize, and all plants other than Gramineae tested were highly resistant; one hundred wheat varieties belonging to eight subspecies of *Triticum* were all about equally susceptible. *O. graminis* exists as a grass parasite in the native sod.

The fungus remained viable in pots kept free from vegetation for one year in the greenhouse and for two years out of doors, subsequently infecting wheat sown in this soil.

Different isolates of *O. graminis* varied greatly in their pathogenicity to wheat, some varying markedly at different periods though the cause of this was not ascertained.

Heavy infection of artificially inoculated wheat seedlings was favoured as a rule by a relatively low soil moisture content (35 to 40 per cent. saturation) [ibid., xi, p. 291] and a relatively high temperature (22° C.), but the fungus was very actively parasitic

over a somewhat wide range of soil moisture and temperature conditions.

Under the conditions prevailing in western Canada the best means of controlling take-all consists in crop rotation, in which summer fallow and highly resistant crops such as oats, maize, flax, sunflower, peas, &c., are alternated with wheat.

SANFORD (G. B.) & BROADFOOT (W. C.). **On the prevalence of pathogenic forms of Helminthosporium sativum and Fusarium culmorum in the soil of Wheat fields and its relation to the root rot problem.**—*Canadian Journ. of Res.*, x, 3, pp. 264–274, 1 graph, 1934.

An attempt was made to determine the relative virulence, on Marquis wheat seedlings and mature plants in the greenhouse at soil temperatures ranging from 13° to 21° C., of 227 collections of *Helminthosporium sativum* and 286 of *Fusarium* sp. (*culmorum* type) from diseased crown tissue of wheat stubble in five fields in the black soil belt of central Alberta [*R.A.M.*, xii, p. 684]. The plants were grown in open pots in sterilized, artificially inoculated soil, 2,672 pots being used for the *Fusarium* tests on seedlings and 1,164 for those on mature plants, while the corresponding figures for the *H. sativum* experiments were 1,948 and 532, respectively.

In general, the data from these trials [which are tabulated and discussed] indicate only a moderate to weak pathogenicity of *H. sativum* on seedlings and still slighter effects on mature plants, while the *Fusarium* caused little damage to seedlings and practically none on older individuals. There were, however, a few virulent strains of both fungi in the fields under observation. Taking the results as a whole, a much larger proportion of *H. sativum* collections were more injurious to wheat seedlings than the corresponding isolations of the *Fusarium*, some 85 per cent. of which showed a degree of virulence below 20 per cent.; only 30 per cent. of the *H. sativum* collections fell in this group, the remainder being placed in classes up to 90 per cent., with the majority between 20 and 50 per cent.

In view of the great susceptibility of seedlings in sterilized, reinfected soil and the variable results, presumably due to the action of associated soil contaminants in open pot culture, it was concluded that the technique here employed is not adapted to the object of the investigations. The possibility of securing consistent results on mature plants in sterilized, reinfected soil, protected from accidental contamination, is discussed in relation to the root rot problem.

MCCLELLAND (C. K.) & YOUNG (V. H.). **Seed Corn treatments in Arkansas.**—*Journ. Amer. Soc. Agron.*, xxvi, 3, pp. 189–195, 1934.

In north-western Arkansas the maize diseases caused by *Diplodia zeae* and *Gibberella saubinetii* are of relatively slight importance, and no assured benefit from seed-grain treatment was derived in four years' trials on the Paymaster variety. Except in 1929, semesan jr. [*R.A.M.*, xi, p. 350] caused a significant reduction or delay in the germination in all early plantings. Stimulatory

effects were exercised by Du Bay 1100 and merko [ibid., ix, p. 521] in 1932. The results obtained with sterocide [ibid., ix, p. 373] were conflicting.

SWANSON (C. O.). **Some factors involved in damage to wheat quality.**—*Cereal Chem.*, xi, 2, pp. 173–199, 1934.

It was shown by experiments [the results of which are fully discussed and tabulated] at the Kansas Agricultural Experiment Station that moulding [fungi unspecified] of stored wheat seed-grain may be prevented by the complete exclusion of air and treatment with ceresan (1 part to 300 of seed-grain). Little development of mould occurred on grain stored in a room at 60° F. or kept outdoors during the winter when the moisture content did not exceed 20 per cent., and none at 18 per cent. or below. Some mould growth occurred on grain stored in a box at 95° or kept in the laboratory during the winter with a moisture content of 14 per cent., the moulding increasing *pari passu* with rising humidity [cf. *R.A.M.*, xii, p. 757]. After some 13 to 16 weeks under conditions of combined high temperature and moisture the damage from moulds was very considerable.

PUTTERILL (V. A.). **Citrus wastage investigations. Progress report no. 2. Season 1933.**—*S. Africa Dept. of Agric. Bull.* 131, 40 pp., 4 figs., 1934.

A detailed account is given of a comprehensive series of experiments carried out in two localities in South Africa in 1933 to estimate the influence exerted by numerous factors on the fungal wastage (nearly all due to *Penicillium digitatum*) [*R.A.M.*, xiii, p. 228] of stored Navel oranges, the points dealt with including the effects of very careful handling and packing, varying the wilting period before packing, distance of transport from orchard to packing-shed, washing in sodium bicarbonate, and tight packing; a test was also made of the keeping quality of puffy and weak-skinned fruits.

The results obtained [which are tabulated and fully discussed], while not regarded as conclusive [cf. ibid., xi, p. 104], are to be used as a basis for further investigations.

BATCHELOR (L. D.) & SCHOONOVER (W.). **Present state of Citrus mottle leaf studies.**—*California Citrograph*, xix, 5, pp. 112, 132, 1934.

The practice of spreading zinc sulphate at the foot of citrus trees in California for the control of mottle leaf [*R.A.M.*, xii, p. 434; xiii, p. 438], having been found highly injurious to the trees, has been discontinued. While a somewhat larger amount spread under the drip of the tree but not against the trunk may prove to be less injurious and ultimately equally beneficial, the author states that excellent results have been obtained by spraying with mixtures containing zinc sulphate, affected trees having in some instances been greatly improved in a few weeks by this method. A formula recommended as reasonably effective and safe for a limited test is 10 lb. zinc sulphate (25 per cent.), 5 lb. hydrated lime, and $\frac{1}{4}$ lb.

blood albumin spreader in 100 galls. water. The trees should be well covered with the fluid but need not be drenched.

MALENÇON (G.). **Nouvelles observations concernant l'étiologie du bayoud.** [New observations on the etiology of the 'baïoud' disease.]—*Comptes rendus Acad. des Sciences*, cxcviii, 13, pp. 1259–1261, 1934.

A study of *Cylindrophora albedinis*, the causal organism of the 'baïoud' disease of date palms [in Morocco: *R.A.M.*, xii, p. 626], revealed striking variations in the morphology of the conidia, some of which are pluriseptate, straight or slightly curved, with rounded apices, while others are sharply bent with tapering, acute extremities (falcate) and either unicellular or furnished with a single median transverse septum. The sclerotia are actually of a very dark greenish-blue though appearing black at the first glance; they are best developed on Czapek's or Waksman's agar media. These characters, taken in conjunction with others previously recognized, e.g., the pink or purple colour of the cultures and the formation of terminal or intercalary chlamydospores, suggested that *C. albedinis* might be the microconidial stage of a *Fusarium*, and at the beginning of 1933 small, pale pink sporodochia were detected emerging through the bark at the base of a diseased palm and forming on the exterior a velvety, pulverulent, macroconidial layer. Adjacent pustules produced only microconidia. The entire complex of fructifications was more or less covered by a white network of slender mycelial elements bristling with conidiophores bearing the typical microconidia of *C. albedinis*. Monospore cultures of the latter yielded the *Fusarium* macroconidia and vice versa, thereby conclusively proving that the agent of the baïoud disease is a *Fusarium* to which the name of *F. albedinis* (Killian et Maire) Malençon is given. The new species belongs to the *Elegans* section and morphologically resembles *F. vasinfectum*, from which it differs, however, in its mode of entry into the host through wounds and apparently not by way of the soil.

BOURIQUET (G.). **Le Caféier d'Arabie à Madagascar, dans la région du lac Itasy, et l'Hemileia vastatrix.** [Arabian Coffee in Madagascar, in the region of Lake Itasy, and *Hemileia vastatrix*].—*Agron. Colon.*, xxiii, 197, pp. 133–135, 1 pl., 1934.

In a test carried out in an experimental plot of Arabian coffee in Madagascar during the wet season of 1932–3 three applications of a copper spray at a total cost of about 30 centimes per bush gave adequate control of *Hemileia vastatrix* [see next abstract]. Encouraged by the results obtained, all the local European and some of the native growers now spray their coffee, over 58,000 bushes being treated in 1932–3; the condition of the plantations is at present very satisfactory.

BOURIQUET (G.). **Les maladies du Caféier à Madagascar.** [Coffee diseases in Madagascar.]—*Agron. Colon.*, xxiii, 193, pp. 1–10; 194, pp. 42–48; 195, pp. 73–82; 196, pp. 109–118, 4 pl., 1934.

The leaf disease of coffee caused by *Hemileia vastatrix* [*R.A.M.*, xiii, p. 229, and preceding abstract] is stated to have been mainly

responsible for the replacement on the east coast of Madagascar of the highly susceptible *Coffea arabica* by more resistant but less valuable species, the cultivation of the former being now restricted to the highlands of the volcanic Itasy region, where the first commercial plantation was started at the beginning of 1926. At first the bushes developed normally, in spite of slight attacks by *H. vastatrix*, but as they came into full bearing in 1930 they began to suffer to a very considerable extent from the disease. This led the author in October, 1931, to undertake spraying experiments in three different plantations at altitudes varying from about 1,250 to 1,600 m., the results of which showed that the disease is amenable to control with either Burgundy mixture (1·5 kg. copper sulphate, sufficient carbonate of soda to render the mixture slightly alkaline, 375 gm. colophony soap [ibid., xiii, p. 113], and 100 l. water) or Bordeaux mixture (1·5 kg. copper sulphate, sufficient lime to render the mixture slightly alkaline, 1 l. skimmed milk, and 100 l. water), the number of applications varying from three or four at the highest to six or seven at the lowest altitude. The application of stable manure and mineral fertilizers to the coffee bushes did not appear to have any influence on the beneficial effect of the treatment, which resulted in an appreciable increase (varying from 1·76 to 12·50 per cent.) in the production of large-sized coffee beans by the sprayed bushes. Under the local working conditions the maximum cost of spraying is estimated at a total of 0·50 franc per bush per year, which should leave a high margin of profit to the growers, especially since coffee from the treated bushes was found on arrival in France to be of much better quality than that from the controls, and thus to command higher market prices.

Brief notes are given on other fungal and insect diseases of coffee in Madagascar, including a species of *Verticillium* which develops on *H. vastatrix* pustules, possibly parasitizing the latter; *Cercospora coffeicola* [ibid., xii, p. 552], which occasionally is severe on the east coast; anthracnose (*Gloeosporium coffeanum*) [(?) *Glomerella cingulata*: ibid., i, p. 4], which is rare; *Corticium salmonicolor*, chiefly in poorly cultivated plantations; a root rot associated with sterile rhizomorphs very similar in their structure to those of *Armillaria mellea* [ibid., xii, pp. 201, 422, 760]; the root rot associated with an unidentified mycelium and the coccid insect *Lachnodium greeni* [see next abstract]; and a species of *Aschersonia* which was isolated from mummified remains of coccid insects on coffee twigs.

MAUBLANC (A.) & ROGER (L.). **La phthiriose du Caféier.** [Phthiriosis of Coffee.]—*Comptes rendus Acad. des Sciences*, cxcviii, 4, pp. 191–192, 1934.

After referring to the coffee disease caused in Madagascar by a fungus closely resembling *Polyporus coffeae*, in association with a coccid insect [*Lachnodium greeni*: *R.A.M.*, xi, p. 699, and preceding abstract], the authors state that specimens of *P. coffeae* from the Cameroons examined by them showed conidia closely resembling and perhaps identical with those of *Bornetina corium*, the agent of phthiriosis of the vine [ibid., i, p. 117]. That a relationship exists between *P. coffeae* and this conidial form is, however,

improbable; it is more likely that the latter is associated with a *Septobasidium*, as Patouillard has already suggested for *B. corium*.

MAUBLANC (A.) & ROGER (L.). **Une nouvelle rouille du Caféier au Cameroun.** [A new Coffee rust in the Cameroons.]—*Comptes rendus Acad. des Sciences*, cxcviii, 11, pp. 1069–1070, 1934.

A rust, differing widely in the symptoms it causes as well as in its morphology from the widespread coffee rust due to *Hemileia vastatrix* [*R.A.M.*, xii, p. 169], was recently observed on *Coffea arabica* in the Cameroons. It is considered to be an undescribed fungus and is provisionally named *Uredo coffeicola*.

Whereas *H. vastatrix* produces diffuse, discoloured areas, becoming rounded or sinuous by confluence, the new rust completely covers the under side of the leaves with a thick dust of orange uredospores. All the leaves arising from a single branch may be attacked. The mycelium can be distinguished from that of *H. vastatrix* by its sparse, straight, and simple hyphae, which enter the spongy parenchyma perpendicularly without penetrating the palisade tissue; haustoria are specially abundant in the deeper layers of the mesophyll.

In the formation of the uredosori of *U. coffeicola* one or more hyphae grow towards the ostiole of a stoma, forming a series of large vesicles (20 to 30 μ in diameter), one or more of which push up finger-shaped extensions resembling dense heads of sterigmata and bearing the uredospores either in the stomatal cavity or on the exterior. The uredospores are broadly oval or subtriangular, sometimes slightly reniform, 24 to 32 by 18 to 26 μ, and the epispore is provided with conical, evenly distributed protuberances almost as wide at the base as they are high (3 to 5 μ). They are thus markedly different from the well-known uredospores of *H. vastatrix*.

DASTUR (J. F.). **Cotton anthracnose in the Central Provinces.**—*Indian Journ. Agric. Sci.*, iv, 1, pp. 100–120, 2 pl., 2 figs., 1 graph, 1934.

In 1931 an anthracnose of cotton due to a species of *Colletotrichum* [*R.A.M.*, xii, p. 267] was unusually prevalent in the Central Provinces of India, where it caused considerable damage. Bolls of all sizes may be attacked and in severe cases shedding occurs before maturity. When the boll is infected through the pistillary end the entire boll may be involved; the locks may be split and their contents rotted. The inner boll wall, when involved, assumes a yellow to black discoloration and is often covered with minute, black stromata; the lint hairs in contact with the diseased area are stained yellow or brownish, or clumped into a solid, brittle mass of fibres. The progress of infection is much more rapid in moist than dry weather. The fungus reaches the seed either from the lint or through the placenta, infection in the former case generally being confined to the outer integument, while in the latter the funicle may be penetrated and the embryo invaded. Severely diseased seeds are abnormally light, poorly and

irregularly developed, and of a brownish-yellow colour. Seedling infection may arise from the underground parts or the cotyledons and cause either damping-off or wilting according to the point of attack and the stage of maturity of the plant. The presence of the *Colletotrichum* acervuli on the underground parts of the seedling is the sole conclusive evidence of anthracnose, the symptoms of which at this stage are otherwise liable to confusion with those due to *Pythium aphanidermatum*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], or *R.* [*Corticium*] *solani* [ibid., x, p. 660].

Hyphae occur abundantly in the outer integument of diseased seeds, penetrating between the cells and sometimes collecting into stromatic masses. The inner integument and embryo are invaded only through the thin-walled, short cells of the funicle in severe attacks. As a rule, badly infected seeds do not germinate, but sometimes the cotyledons emerge and normal leaves develop before the death of the plant from the spread of the fungus to the growing point.

Inoculation experiments with the *Colletotrichum* on the bolls were most successful through punctures or on the suture of two adjoining loculi. Seedlings were infected by placing the inoculum near the collar or on the tap-root below soil level. Flowers and flower buds rapidly contracted infection.

Good results in the control of this disease have been obtained by one hour's immersion of the seed in 0·25 per cent. uspulun, dusting with the same preparation, or delinting with sulphuric acid (1 part to 15 to 20 parts by volume of the seeds).

The digitate, often slightly curved, hyaline conidiophores of the causal organism, broadly rounded at the apex and flat at the base, measure 7·7 to 13·2 by 1·6 to 2·7 μ; from their tips are abstricted a succession of falcate, hyaline conidia, averaging 20 to 22·5 by 2·5 μ, with a range of 15 to 25 by 1·8 to 4·3 μ. The dark brown setae (often paler at the apex and base) measure 76·5 to 125·5 by 3·8 to 7·6 μ. The fungus is considered to be an undescribed species and is provisionally named *C. indicum* Dast.

Field observations indicate that the *Gossypium neglectum verum* types of cotton are most susceptible to anthracnose, Bani (*G. indicum*) being resistant and *G. neglectum roseum* of intermediate reaction.

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **Variety tests in the differentiation of two Cotton wilts.**—*Phytopath.*, xxiv, 3, pp. 292–295, 1 graph, 1934.

Cotton varieties have been tested in Texas for their reaction to wilt caused by *Fusarium vasinfectum* [*R.A.M.*, xii, p. 42] and to an apparently different wilt temporarily designated 'Waxahachie wilt' from the district in which it was found. The latter disease is marked by a discoloration of the central part of the stems or roots, instead of the darkening of the outer xylem found in *Fusarium* wilt. None of the fungi isolated from cases of the new disease has reproduced it, so that its cause is still obscure. The varieties tested reacted somewhat differently to the two diseases. Thus, both in 1929 and 1930, Rhyne's Cook showed the least infection by *F. vasinfectum* but was only moderately resistant to

Waxahachie wilt. The Watson and Wannamaker-Cleveland selections of Dixie Triumph are both about equally resistant to *Fusarium* wilt but show considerably greater susceptibility to the Waxahachie form.

NICHOLLS (H. M.). **Diseases of adult bees.**—*Tasmanian Journ. of Agric.*, v, 1, pp. 13–17, 3 figs., 1934.

The author states that the wholesale dying-off of adult bees which has recently been reported from several apiaries in Tasmania has been found to be due in part to the well-known microsporidiosis caused by *Nosema apis* (apparently its first record in Tasmania) and in part to infection by *Trichoderma lignorum* [*R.A.M.*, v, p. 300]. In the great majority of the cases investigated the two organisms were found to occur in close association with one another in the chyle-stomach of the dead bees, the walls of which were riddled by the hyphae of *T. lignorum*, and in many cases the outer coating of muscular fibres was detached from the underlying cells by the mycelium. There did not appear to be any definite external symptoms of infection by either organism, apart from the rapid dwindling of the bee colonies, and no external growth developed on dead bees when incubated.

T. lignorum was found to be still viable in dead bees kept dry for over a year in the laboratory. One of the main sources of infection appears to be drinking water, especially that in close proximity to infected beehives. The fungus has been found several times in the cells of combs from infected hives, and it is possible that it is introduced into the cells by foraging bees, and can thence infect the whole hive. The paper terminates with a brief consideration of possible means of control of the disease.

HENDEE (ESTHER C.). **The association of the termites, Kalotermes minor, Reticulitermes hesperus, and Zootermopsis angusticollis with fungi.**—*Univ. of California Publ. in Zool.*, xxxix, 5, pp. 111–134, 1 fig., 1933.

This is an extended and fully tabulated account of the writer's researches on the association between certain termites and fungi in various hard- and soft-woods in California, a condensed version of which has already appeared [*R.A.M.*, xii, p. 460].

DRECHSLER (C.). **Organs of capture in some fungi preying on nematodes.**—*Mycologia*, xxvi, 2, pp. 135–144, 1934.

Attention is drawn to some close parallels between Sherbakoff's recently established genus *Anulosporium*, represented by *A. nematogenum* n. sp. [*R.A.M.*, xii, p. 763], and other nematode-capturing fungi, e.g., *Dactylaria candida* (Nees) Sacc. and certain species of *Monacrosporium*, one of which, *M. subtile* Oud., also somewhat resembles a *Fusarium*-like organism found by the writer capturing nematodes in solitary, non-constricting loops [loc. cit.]. The characteristic globose cells of *D. candida*, which manifestly correspond to the 'globular bodies' of *A. nematogenum*, are believed to constitute complete organs of capture, independent of the loops, for smaller prey. Similar loops are formed in the above-mentioned *Fusarium*-like species of *Monacrosporium*. The nature

and functions of the organs of capture in a number of other predacious fungi are fully discussed, with references to the relevant literature.

STEYN (D. G.). **Fungi in relation to health in man and animal.**—*Onderstepoort Journ. Veter. Sci.*, i, 1, pp. 183–212, 1933.

After reviewing the literature on fungi harmful to man and domestic animals, the writer tabulates and discusses the results of experiments on rabbits at Onderstepoort, South Africa, from which it appeared that maize infected by *Diplodia zeae* produced toxic effects on various occasions [cf. *R.A.M.*, xiii, p. 218]. The toxicity of darnel (*Lolium temulentum*) is usually attributed to the infection of the grains by *Endoconidium temulentum* [ibid., vii, p. 88, and next abstract], the active principle of which is an alkaloid, temulin, absent from fungus-free plants, but two rabbits, a pig, and a dog consumed large quantities of infected darnel without ill effects. Rabbits and pigs further failed to react to feeding on cultures of *Fusarium moniliforme* [*Gibberella moniliformis*], *F. moniliforme* var. *subglutinans*, and *G. saubinetii* (*F. graminearum*) [ibid., x, pp. 91, 651], while maize and bran heavily infected with various organisms (including *Rhizopus nigricans* and *F.* sp.) were innocuous to rabbits and fowls. In general horses and pigs seem to be more susceptible to mouldy foodstuffs than ruminants and fowls, the positions being reversed, however, in the case of *D. zeae* on maize.

LEEMAN (A. C.). **A short summary on our botanical knowledge of Lolium temulentum L.**—*Onderstepoort Journ. Veter. Sci.*, i, 1, pp. 213–218, 2 figs, 1933.

A summary is given of the available literature on *Lolium temulentum*, with special reference to the question of the part played by *Endoconidium temulentum* in its toxicity to man and stock [see preceding abstract].

JUNGHERR (E.). **Mycosis in fowl caused by yeast-like fungi.**—*Journ. Amer. Veter. Med. Assoc.*, lxxxiv, 3, pp. 500–506, 4 figs., 1934.

Mycoses of birds are divisible into three main groups, namely, favus due to *Achorion schoenleini* var. *gallinae* [cf. *R.A.M.*, x, p. 243], aspergillosis associated with *Aspergillus fumigatus* [ibid., xiii, p. 371], and 'sour crop' or mucous membrane infections caused by *Monilia* and *Oidium* spp., with which the present investigation (carried out in Connecticut) is concerned. All domesticated birds and game birds reared in captivity are liable to these diseases, especially in wet early summers. Immune carriers of the fungi appear to be uncommon, but there is evidence that the latter may persist for some time in a saprophytic state. The author's observations indicate that they may be introduced to farms and the like through the agency of hatching eggs, presumably on the shell. These yeast-like fungi are resistant to disinfection with common coal-tar derivatives but succumb to iodine in relatively high dilutions [cf. ibid., xii, p. 509]. The two principal organisms implicated in the development of 'sour crop' are *M.* [*Candida*] *albicans* and

O. pullorum n. sp., the latter characterized by septate, slightly clavate hyphae, 3·5 μ in width, elliptical oidia arranged in the necklace form typical of the genus, and chlamydospores. This species, which grows well at 37° C. and is capable of utilizing the glucoside aesculin, was compared with *O.* [*Oospora*] *lactis*, a common contaminant of dairy utensils and sour milk [ibid., xiii, p. 97], and found to differ in various morphological and biological characters. *M.* [*C.*] *krusei* [ibid., xiii, p. 370] is of widespread occurrence in birds, to which, however, it is apparently non-pathogenic.

AGOSTINI (ANGELA). **Miceti della Somalia.** [Mycetes of Somaliland.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 191–201, 4 figs., 1933. [Latin summary. Received May, 1934.]

Notes are given on 19 fungi associated with human or animal diseases observed in 1932 in Italian Somaliland and including *Coccidioides immitis* [*R.A.M.*, xiii, p. 235], isolated from a cutaneous affection of the leg of a European patient, and *Monacrosporium tedeschi* n. sp., isolated from skin lesions mainly on the legs of four natives suffering from 'avitaminosis' (scorbutic beriberi). In the latter organism the hyaline mycelium bears lateral conidiophores at the tips of which an oblong-elliptical conidium, at first continuous, later 1- to 4-septate, is formed. This rapidly becomes detached owing to the immediate formation of another below it. The conidia, which remained in close proximity to one another, measured 16 to 19 by 4 to 7 μ. As conidial formation ceased or diminished, intercalary chlamydospores and terminal aleuria developed, the latter of which were usually round, verrucose (sometimes smooth), and measured 9·5 by 7 μ. Some of these organs fused in pairs, a 'zygospore' being formed that was able to reproduce the mycelium. A Latin diagnosis is given.

ILDRIM (D.). **Die Dermatomykosen Favus, Trichophytia, und Mikrosporia in Aserbaydshan (Transkaukasus).** [The dermatomycoses favus, trichophytosis, and microsporosis in Azerbaidjan (Transcaucasia).]—*Arch. Schiffs u. Tropenhyg.*, xxxvii, pp. 505–508, 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cxiii, 17–18, pp. 393–394, 1934.]

Dermatomycotic affections are stated to be widely distributed in Azerbaidjan, Transcaucasia. Among 430 patients, 321 gave cultural evidence of infection by *Achorion schoenleini*, 16 of *Trichophyton gypseum granulosum* [*T. granulosum*], 15 of *Microsporon lanosum*, 12 of *T. cerebriforme*, 11 of *T. faviforme*, 10 of *T. violaceum*, and the remainder were distributed in smaller numbers amongst several species. The predominance of favus is attributed to the refractory character of the trouble, which may persist in a given individual for as long as 35 years and so increase the risks of spreading *A. schoenleini* among the population.

WILLIAMS (J. W.). **Scalp products and hair as a culture medium for certain pathogenic fungi.**—*Proc. Soc. Exper. Biol. and Med.*, xxxi, 5, pp. 586–588, 1934.

Comparative studies were made of the rate of growth of certain fungi pathogenic to the human hair (*a*) on a medium of barber's

shop hair cleansed with water and autoclaved, and (*b*) on Sabouraud's conservation medium.

Nine organisms growing well on the latter substratum failed to develop on the former, viz., *Achorion schoenleini*, *Acladium castellanii* [*R.A.M.*, vii, p. 240], *Candida candida* [*C. vulgaris*], *Endomyces dermatitidis* [ibid., xiii, p. 235], *Epidermophyton inguinale* [*E. floccosum*], *Glenospora gammeli* [loc. cit.], *Microsporon audouini*, *Oospora humi*, and *Willia anomala* [ibid., vii, p. 471]. On a child's hair, however, *M. audouini* developed in seven days [cf. ibid., xiii, p. 96]. On both the hair-water medium and Sabouraud's, growth within four days was made by *Indiella americana* [ibid., ix, p. 782], *Lichtheimia* sp., *Monosporium* [*Scedosporium*] *apiospermum* [loc. cit.], *Scopulariopsis brevicaulis* [*Penicillium brevicaule*: ibid., xiii, pp. 372, 443], *Trichophyton japonicum*, and *T. interdigitale* [*T. mentagrophytes*]. *Geotrichum bachmanni* and *T. granulosum* developed in four days on Sabouraud's medium and in seven on the hair-water substratum, while *Endomyces capsulatus* [ibid., xiii, p. 95], *Monilia* [*C.*] *albicans*, and *T. crateriforme* [ibid., xiii, p. 96] required 20 days for growth to appear on the latter and only four on the former. *Endodermophyton tropicale* [*T. concentricum*: ibid., xi, p. 646], on the other hand, grew in five days on the hair-water medium but required seven on Sabouraud's.

CATANEI (A.) & GOINARD (P.). **Un nouveau cas algérien de mycétome du pied.** [A fresh Algerian case of mycetoma of the foot.]—*Bull. Soc. Path. Exot.*, xxvii, 2, pp. 176–178, 1 fig., 1934.

From a mycetoma of the foot in Algeria the writers isolated a fungus with abundant ovoid to piriform, globular, or elongated, olive-brown conidia, 7 to 8 by 4 to 5 μ, borne on conidiophores frequently grouped in coremial masses. Chlamydospores, 4 to 12 μ in diameter, were present on irregular hyphae in the 'grains' of the mycetoma. The organism resembles *Allescheria boydii* Shear 1921, isolated from a similar case in North America, and is probably a closely related species.

BRUMPT (E.) & LANGERON (M.). **Considérations sur la piedra de l'Amérique du Sud, à l'occasion d'un cas provenant du Venezuéla. Description d'une espèce nouvelle Piedraia venezuelensis n. sp.** [Considerations on the South American 'piedra' in connexion with a case from Venezuela. Description of a new species, *Piedraia venezuelensis* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 2, pp. 134–161, 1 pl., 32 figs., 1934.

In this paper the authors draw a clear distinction between two types of 'piedra', the one of which, due to species of *Trichosporum*, chiefly occurs in the Old World [*R.A.M.*, xii, p. 172] and is characterized by light-coloured nodules on the affected hairs, consisting of an apparently sterile stroma and propagating by means of arthrospores. The other type is caused by species of *Piedraia* [ibid., ix, p. 36] and is so far restricted to South America [but cf. x, p. 243]. It is characterized by nodules of a very dark, almost black, colour, composed of a true ascostroma containing scattered embedded asci; careful investigation of samples sent in from

various South American States failed to reveal the presence of perithecia, such as have been reported by some other workers [ibid., x, p. 27; xii, p. 444]. In a few instances, however, some of the asci were found to be enclosed in a sac-like structure, which, on closer examination, was shown to be nothing else than an incurved fragment of the hair cuticle disrupted by the fungus.

A detailed account is given of the mycological study of five specific cases, two of which, originating from Brazil, were found to be caused by *P. hortai* [ibid., ix, p. 36; x, p. 27, *et passim*]; the third, also from Brazil, came labelled as *P. sarmentoi* [ibid., ix, p. 720], but as it was morphologically indistinguishable from the former, the authors are inclined to consider this a synonym of *P. hortai*. In all three the eight ascospores in each ascus had a long filiform appendage at each end. In the fourth case, from Colombia, the fungus had the same morphological details, except that the bipolar filaments were considerably shorter; it is also referred to *P. hortai*. The fifth case was communicated from Venezuela, and stated to be the first record of this type of 'piedra' in that country. It differed from the others in the shape of the hair nodules, which were ovoid or fusiform instead of conical and more or less sharply truncate, and also in the fact that the asci contained four instead of eight ascospores, which were without polar filaments, their ends simply tapering to a more or less elongated and sharp point. The asci in this fungus were about the same size as in the former cases (from 30 to 40 μ in length); the spores were rather thicker, their body measuring from 25 to 30 (occasionally 35) by 10 to 14 μ, with long points (10 to 12 μ) at each end; their general shape was that of a short and thick crescent. This fungus is considered to be a distinct species, and the name *P. venezuelensis* sp. n. is suggested for it, but without a full technical diagnosis.

MILOCHEVITCH (S.). **Trichophyton faviforme album als Erreger eines Kopfhautfavus.** [*Trichophyton faviforme album* as the agent of a scalp favus.]—*Med. Pregl.*, *1933*, 9, 1933. (Jugo-Slav, with French summary.) [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cxiii, 17–18, p. 393, 1934.]

A sharply defined mantle of thick mycelial cells enveloped the hair shafts in a typical case of favus with localized scar formation examined at Belgrade. The scutula were composed of the spores and mycelial elements of a megasporous dermatophyte. Cultures yielded *Trichophyton faviforme album* [*T. album*: *R.A.M.*, xiii, p. 303] in characteristic colonies with a faviform centre, a white, pulverulent zone, and a colourless edge with radiating extensions. The case is considered to afford a further illustration of pleomorphism in the dermatophytes by an addition to the ranks of scutula-formers.

BEINTEMA (K.). **Über einen neuen Pilz der Endothrixgruppe: Trichophyton floriforme n. sp.** [On a new fungus of the endothrix group: *Trichophyton floriforme* n. sp.]—*Arch. für Dermatol.*, clxix, 4, pp. 575–581, 6 figs., 1934.

From the hair on the neck of a boy at Groningen, Holland, the writer isolated a *Trichophyton* of the endothrix group. On

Sabouraud's medium with maltose the hyphae measured 3 to 5 μ in diameter, and sometimes terminated in a septate, clavate swelling 8 μ in diameter; the spores were of very variable dimensions and formed in bunches. Terminal, lateral, and intercalary chlamydospores, 12 to 18 μ in diameter, with or without stalks, were also formed. Inoculation experiments on guinea-pigs resulted only in a very mild type of infection, followed by spontaneous healing. The fungus is related to *T. regulare* and *T. sulphureum* but is considered to be a new species and is named *T. floriforme*, the specific name referring to the flower-like aspect of the maltose cultures.

NEILL (J. C.). **The control of mould fungi in dairy factories and meat works.**—*New Zealand Journ. of Agric.*, xlviii, 2, pp. 70–75, 1934.

Experiments were carried out for the prevention of mould growth on the woodwork of factories where milk, meat, and the like are handled, since this is a common source of food stuff contamination [cf. *R.A.M.*, xiii, p. 443]. When wooden blocks planed smooth at the top and sides but left rough (as sawn) at the ends were inoculated with *Penicillium puberulum* [ibid., xii, p. 696], *P. expansum*, and *Cladosporium herbarum*, respectively, renewed sporulation was completely inhibited by dipping the blocks in, and wetting the mould colonies with, formalin solution (38·5 per cent.) 1 part in 20 parts water, kept in closed containers; borax solution (5 per cent.) inhibited sporulation of *P. puberulum* and *P. expansum* only. Renewed growth of *C. herbarum* was prevented by formalin 1 in 50 and copper sulphate 1 or 2 per cent., but various common chlorine disinfectants failed to prevent subsequent renewal of growth. Neither *C. herbarum* nor *P. expansum* was completely controlled by formalin when exposed in open dishes after treatment, though renewed sporulation occurred only on the rough surfaces of the blocks. The action of ammonia was similar to that of formalin on *C. herbarum*, but it had no apparent effect on *P. expansum*.

Thorough washing with water at 132° to 150° F. effectively controlled *C. herbarum*, especially when the blocks were rubbed with a cotton swab while under the water, but when the blocks were dipped for 5 seconds a temperature of 185° was necessary to give control on the rough surfaces, though on the smooth ones there was no renewal of growth after dipping at 165°. When a steam jet was directed for 3 seconds on the colonies of *C. herbarum* and *P. expansum*, growth was arrested on the smooth surfaces at 165°, but continued on the rough ones even after exposure to 195°.

STUART (L. S.) & FREY (R. W.). **Some practical observations on the molding of pickled sheepskins.**—*Journ. Amer. Leather Chem. Assoc.*, xxix, 3, pp. 113–118, 3 pl., 1 graph, 1934.

The examination of brown-stained pickled sheepskins dispatched to the United States in casks from New Zealand disclosed the presence of an *Alternaria* and a *Penicillium*, the former producing a dark brown, insoluble, mycelial pigment and the latter a diffu-

sible, yellowish-brown one on Czapek's agar. Both organisms grew in the presence of 12 per cent. sodium chloride at P_H 2·4 and above, while at 1·8 only the *Penicillium* showed slight growth with 0 and 4 per cent. sodium chloride. Inoculation experiments with both moulds on skins soaked in a liquor containing 12 per cent. sodium chloride and 1·5 per cent. sulphuric acid gave negative results, and this indicated that the acidity of the damaged skins in question had undergone reduction during transit. It was then experimentally ascertained that the wood of the casks had absorbed the acid from the skins packed against it, and that it furnished a suitable substratum for the growth of the two above-mentioned fungi and *Aspergillus niger*. It would thus appear that the mildewing could have been largely or entirely prevented by a slight increase in the acidity of the original pickling liquor, or by soaking the casks before packing with the liquor. In substantiation of Blank's observations [see above, p. 486], p-nitrophenol at low concentrations in an acid substratum proved to be a highly effective fungicide. Skins prepared in a pickle containing, in addition to sodium chloride and sulphuric acid, 0·025 per cent. p-nitrophenol developed no mould during a 90-day incubation period.

ALLISON (C. C.). **Powdery mildew of Flax in Minnesota.**—*Phytopath.*, xxiv, 3, pp. 305–307, 1934.

The leaves, stems, and sepals of the C.I. 669 and C.I. 743 flax varieties near Anoka, Minnesota, were observed in 1933 to be heavily infected by a powdery mildew, with reddish-brown perithecia, 84·7 to 142·7 μ in diameter (mean $112·5 \pm 0·37$ μ), bearing numerous flexuous, darkened, simple appendages and usually containing eight to twelve stalked asci, 21·3 to 34·6 μ ($27·9 \pm 0·20$ μ), occupied by two (rarely one or three) ascospores measuring 15·9 to 27·3 by 9·4 to 14·6 μ (mean $21·4 \pm 0·13$ by $11·6 \pm 0·07$ μ). These dimensions agree with those of *Erysiphe cichoracearum* [*R.A.M.*, x, p. 459], and the conidia, measuring 23·1 to 33·5 by 12 to 18 μ ($29·4 \pm 0·16$ by $15·1 \pm 0·09$), appear to correspond with those of *Oidium lini*, described from Jugo-Slavia and Japan [ibid., vii, p. 784].

Carnation diseases.—*The Fruit-Grower*, lxxvii, 1990, p. 179, 1934.

Writing in the January number of the *British Flower Marketing Association Bulletin*, G. W. Wickens gives an account of his investigations, under the supervision of Prof. W. Brown at the Imperial College of Science, on the wilt and stem rot group of carnation diseases. One of the manifestations of this complex condition is die-back (*Fusarium culmorum*) [*R.A.M.*, ix, p. 69], which is stated to be of little commercial importance, though fairly prevalent in nurseries. The shoots slowly die back from 'snags' left in 'stopping' or in cutting a bloom, but the affected plants usually recover. Stem rot (*F. culmorum* and, probably to a lesser extent, *F. herbarum*) [ibid., ix, p. 37; xiii, p. 13], on the other hand, is a really serious disease, causing generalized rotting of the tissues of the collar and occasionally of the branch bases, especially in old plants. Wilt is attributed to a *Fusarium* of the *Elegans* section and *Verticillium cinerescens* [ibid., ix, p. 6], of which the

latter was the more virulent in inoculation tests. The shoots wilt, often only on one side at first but later on both, and the water-conducting vessels become clogged by a brown, gummy substance. No improvement in the condition resulted from maintaining the beds in a dry state, as commonly recommended. Of the nine chemicals used in soil sterilization experiments only formalin and uspulun dust gave any reduction of infection, and the latter seriously injured germination. The risk of reinfection is minimized by the removal of the top soil, but fresh contamination may occur through the subsoil or manure.

OGILVIE (L.) & MULLIGAN (B. O.). **The Fusarium wilt of China Asters in England.**—*Gard. Chron.*, xlv, 2466, pp. 215–216, 3 figs., 1934.

The strains of *Fusarium* responsible for the wilt of China asters [*Callistephus chinensis*] observed by the writers in Worcestershire in 1928 [*R.A.M.*, ix, p. 700] and subsequently studied in, or reported from, other parts of England and Wales, were found to fall into the two groups assigned by Wollenweber to *F. conglutinans* var. *callistephi* and *F. conglutinans* var. *majus* [*R.A.M.*, xii, p. 448]. When the plants have formed their first flower buds, black areas may be detected on the stems, extending upwards from the base and often reaching well into the flower stalks. The leaves show a yellowish discoloration and wilt from the base upwards, either on one or both sides of the plant. The damping-off phase of the disease, common in other countries, was not encountered in the Bristol Province but was reported from Cheshire in 1933. The 'black leg' of asters in England, due to *Phytophthora cryptogea* [ibid., ix, p. 700], is quite distinct from the wilt described above.

In trials on severely infected soil near Evesham a high degree of resistance to *Fusarium* wilt was shown by a number of American varieties that have undergone similar tests in Wisconsin [ibid., xi, p. 302 *et passim*], those most likely to acquire popularity in England being Queen of the Market, American Branching, Improved Crego, and Giant Comet (all white), Upright Branching Crimson, Queen of the Market Dark Blue, and Improved Crego Purple and Deep Rose. No English varieties gave any sign of resistance under the experimental conditions.

CAMPBELL (A. H.). **Virus diseases of Dahlias.**—*The Dahlia Year Book, 1934*, pp. 14–23, 3 pl., 1934.

Dahlia mosaic [*R.A.M.*, xiii, p. 99] is characterized by a leaf mottle which generally consists of irregular, light yellowish-green patches of varying intensity; occasionally the leaf may be almost entirely yellowed, or only the edges may be affected. The leaves also show slight dwarfing, wrinkling, and malformation. Usually, the mottling is most evident while the plant is actively growing, and is much less marked in the older, stunted plants. Affected leaves are thick, hard, brittle, and may be basin-shaped. The larger exhibition types of dahlias are often dwarfed to one-quarter of their usual height, the leaves being of miniature dimensions but otherwise free from any malformation.

Streak is at present the most injurious disease affecting dahlias

in Great Britain. The affected plants are of the larger exhibition types, of which the light-coloured varieties are among the most susceptible, the dark ones being in some cases apparently immune. The distinguishing feature of the disease is the presence of long, black streaks on the stems and petioles; black, necrotic areas may be present on the flower stems and flowers. The lower leaves may die but remain attached to the plant. In the young petiole the attack originates in the phloem and chiefly affects the collenchyma, of the dead cells of which the black streak is composed. A tuber rot, sometimes affecting only a single tuber, is often associated with streak and consists of a brown, necrotic band lining a cavity in the centre of the tuber. The rotted portion is generally surrounded by apparently normal white tissue, and no secondary fungi or bacteria are present. Occasionally the tubers show small brown patches without any definite rot, but these are often probably the early stages of the rot.

Spotted wilt of dahlias is systemic and affected plants sometimes rapidly succumb; the characteristic symptom consists in concentric light and dark green (sometimes yellow) circles on the leaves [ibid., x, p. 694; xiii, p. 333]. The leaves and shoots may temporarily turn bronze before the concentric rings appear. At present the disease is not very common in England, and most cases observed by the author were on dahlias growing in close proximity to affected plants of other species.

The paper concludes with notes on the importance of virus diseases to dahlia growers and brief, practical directions for control.

BERGER (R.). **Wurzelkropf an Dahlien.** [Crown gall of Dahlias.] —*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 13, p. 167, 1934.

Attention is drawn to the occurrence, in the Frankfurt district of Germany, of the proliferation of dahlia shoots in the spring from a cauliflower-like basal swelling due to *Bacterium tumefaciens* [*R.A.M.*, xiii, p. 167]. The disease is most prevalent in damp, heavy soils, which should be well aerated, limed, and if necessary disinfected with uspulun or formaldehyde. Infected tubers may be dipped in an uspulun-loam emulsion. The Jersey Beauty, Andreas Hofer, Leuchtenburg, and other varieties of a rather weak habit of growth appear to be mainly affected.

PASSALACQUA (T.). **Expériences de vaccination sur le 'Pelargonium zonale'.** [Vaccination experiments on *Pelargonium zonale*.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 3, pp. 83–87, 1934.

Inoculations (made directly or by means of the absorption of culture filtrate) of *Pelargonium zonale* plants with the organism belonging to the *Bacterium barkeri* group isolated by the author from streaked leaves of this host [*R.A.M.*, xiii, p. 444], while not exactly reproducing the symptoms, gave partial or complete chlorosis of the leaf margins (according to the concentration of filtrate used), frequently followed by necrosis.

Vaccination with killed cultures either by needle prick of leafy

branches or by direct absorption of vaccine solutions by small branches in full vegetative development gave results which (although irregular) indicated that the host acquired some degree of definite immunity.

LAURITZEN (J. I.) & WRIGHT (R. C.). **Factors affecting Gladiolus in storage.**—*Journ. Agric. Res.*, xlviii, 3, pp. 265–282, 1 graph, 1934.

The results of storage experiments from 1927 to 1931 [details of which are given] at the Arlington Experiment Farm, Rosslyn, Virginia, showed that while very little infection with *Penicillium gladioli* [*R.A.M.*, x, p. 645] developed in the healthy, unwounded corms of all the *Gladiolus* varieties used at any of the conditions of temperature and humidity which were tested, infection was fairly heavy in the naturally or artificially wounded and inoculated corms kept at high relative humidities at 0° and 4·5° C., but not at 10°. The lowest relative humidities (about 63 and 75 per cent. at 0° and 4·5°, respectively) practically eliminated infection, regardless of wounding and inoculation.

Further experiments indicated that the higher temperatures and lower humidities favoured the formation of a suberin and periderm layer in wounded areas of the gladiolus corms, and that this layer is an effective barrier against infection by *P. gladioli* and other species of this genus. It was found that curing wounded corms for ten days at a temperature of 29° C. and a relative humidity of 97 per cent., inhibited a serious development of the rot (even in corms that were inoculated with *P. gladioli* spores over the wounded surface at the end of the curing period and before being stored) under any of the conditions tested. It is believed that this treatment before storage may be employed to prevent infection in the stored corms.

WEIMER (J. L.). **Studies on Alfalfa mosaic.**—*Phytopath.*, xxiv, 3, pp. 239–247, 3 figs., 1934.

An extended account is given of the writer's investigations on the transmissible mosaic of lucerne already reported from California [*R.A.M.*, x, p. 388], and believed to be of fairly wide distribution in other States. The first symptom of infection is the development on the leaves of circular, greenish-yellow, sometimes concentric spots, which often coalesce and cover a large area. The affected tissues fade gradually from greenish-yellow to almost white. The diseased leaves may be reduced to one-third of their normal size, crinkled, and in severe cases, more or less deformed, thickened, and brittle, the stems being also occasionally dwarfed. Details are given of inoculation experiments in which the pea aphid (*Illinoia* [*Macrosiphum*] *pisi*) transmitted this form of mosaic to 27 out of 74 plants (36·5 per cent.). One of the mosaic plants sent by F. R. Jones from Wisconsin for comparison with the Californian material showed slight differences, notably in the more marked crinkling of the foliage and the absence of rings round the spots. The plant in question had grown near many other kinds affected by mosaic, from one of which infection was probably transmitted [cf. ibid., xii, p. 741].

HENDERSON (R. G.). **Occurrence of Tobacco ring-spot-like viruses in Sweet Clover.**—*Phytopath.*, xxiv, 3, pp. 248–256, 4 figs., 1934.

Besides the sweet clover (*Melilotus alba*) disease closely resembling tobacco ring spot [*R.A.M.*, xi, p. 133], a distinct ring spot was observed on sweet clover leaves in Virginia in May, 1932. The leaves showed irregular chlorotic, frequently circular blotches following the midrib and extending along the lateral veins towards the margin. The younger leaves were severely stunted and distorted. Inoculations on Turkish tobacco plants with an aqueous extract from the diseased foliage produced variable necrotic or chlorotic symptoms in the form of lines or rings, cutting off the intercostal tissue into islands of irregular shape; in severe cases the tissue along the veins was abnormally dark. Some of the upper leaves developed broad chlorotic or bleached lines, generally following the veins and near the margin, while yellow blotches were present in the centre. Not all the leaves on a given plant contracted these symptoms, but there appeared to be no masking or permanent immunity as described by Wingard and Price for true tobacco ring spot [ibid., viii, p. 139; xii, p. 120].

Petunia foliage inoculated with the *M. alba* virus showed chlorotic areas along the margin and spots or blotches elsewhere, sometimes turning almost the whole leaf yellow to light green, while in other cases small specks appeared along the midrib and veins or over the entire leaf, to which a grey cast was thus imparted. None of the *Petunia* leaves seemed to be exempt from infection, which assumed a severe form on some of the branch tips, causing foliar distortion and partial tissue necrosis.

Negative results were given by experiments in the retransmission of infection to sweet clover, possibly on account of environmental factors, and the writer also failed to infect *M. alba* with true tobacco ring spot which Wingard has shown will infect *M. officinalis* [ibid., viii, p. 139; xi, p. 132].

FR. **Über das Auswintern des Klees.** [On the winter injury of Clover.]—*Deutsche Landw. Presse*, lxi, 9, p. 110, 1934.

A brief, popular note is given on the stem rot of clover caused by *Sclerotinia trifoliorum* [*R.A.M.*, xiii, p. 240] in Germany. The red [*Trifolium pratense*] varieties of southern European origin are stated to be the most severely affected, and their replacement by German material from disease-free fields is urgently recommended.

DOYER (L[UCIE] C.). **De gezondheidstoestand van Klaverzaad, in verband met de keuring van det zaad en de invloed van ontsmetting op dezen toestand.** [The state of health of Clover seed in connexion with the selection of this seed and the effect of disinfection on that state.]—*Tijdschr. over Plantenziekten*, xl, 2, pp. 54–61, 2 pl., 1 fig., 1934.

After summarizing the differences between the sclerotia of *Sclerotinia trifoliorum*, *Typhula trifolii*, and *Mitrula sclerotiorum* [*R.A.M.*, vii, p. 450; x, p. 670], the writer states that at the Wageningen Seed Testing Station clover seed has only once been

found contaminated by the sclerotia of each of the two first-named [cf. ibid., xii, p. 294], while *M. sclerotiorum* has been recorded in clover seed only in Denmark. It is, however, commonly contaminated by *Botrytis cinerea*, *B. trifolii* [ibid., viii, p. 41], *Fusarium* and *Macrosporium* spp., while references occur in phytopathological literature to clover seed infection by *Sphaerulina trifolii* [ibid., ii, p. 414] and *M. sarcinaeforme* [ibid., xi, p. 377]. There is, further, a somewhat remote possibility of seed transmission in the case of *Gloeosporium caulivorum* [*Kabatiella caulivora*: ibid., xiii, p. 382]. Good results in the disinfection of red [*Trifolium pratense*] and white [*T. repens*] clover seed have been obtained by one hour's immersion in a 0·25 per cent. solution of germisan or ceresan or by dusting with ceresan, the germination percentages of the treated seed being 60, 64, and 51, respectively, compared with 46 for the untreated. In 1924, however, the germinative capacity of the seed was considerably impaired by immersion in germisan or uspulun even at a strength of 0·25 per cent. while a concentration of 0·5 per cent. was found to be definitely injurious. Possibly there may be some connexion between damaged seed coats and a reduction of germination due to over-intensive fungicidal action; in any case it is advisable to submit a sample of each lot of seed to a preliminary test before treating the entire batch.

Cook (W. R. I.). **Some observations on the genus Cladochytrium with special reference to C. caespitis Griffon and Maublanc.**—*Ann. of Botany*, xlviii, 189, pp. 177–185, 1 pl., 9 figs., 1934.

In 1932 the author received from Yorkshire *Agrostis* seedlings killed by a fungus at first thought to be *Cladochytrium graminis* Büsgen, but comparison at Kew herbarium with material of this species and of the fungus on an unnamed grass from Surrey referred by Massee to it showed that both the Yorkshire and the Surrey material differed from the rest and agreed with the description of *C. caespitis* given by Griffon and Maublanc in the size of the resting sporangia (30·7 by 14·8 μ and 34·2 by 25·8 μ, respectively, as against an average of 33·9 by 30·1 μ for the material of Büsgen's species), their elongated or spherical shape, their presence mainly in the roots instead of in the leaves, and the very pale yellow or almost colourless cell wall. The author's organism is accordingly referred to *C. caespitis* (apparently not before recorded in England), and it is suggested that the material from Surrey preserved at Kew as *C. graminis* is also *C. caespitis*.

Infection (presumably by zoospores) results in the formation in the host cell of a small spherical body which then elongates to form a short hypha; this branches out into an irregular unseptate mycelium with densely granular contents and apparently multinuclear. The hyphae swell at various points into vesicles which become differentiated into resting sporangia. Apparently these are at first uninucleate, though when fully mature several nuclei may be present. After a resting sporangium has formed, the hyphae associated with it rapidly disappear. The wall of the mature, ellipsoidal, occasionally spherical, sporangia is thick, smooth on the outside, very light yellow, and 3 to 5 μ wide. Germination was not observed and the thin-walled type of

sporangium liberating uniciliate zoospores, of which Griffon and Maublanc found a single example, was not seen.

Discussing the classification of the genera *Cladosporangium*, *Physoderma*, and *Urophlyctis* the author urges that it would be better to revert to Fischer's treatment and regard them as subgenera of *Cladochytrium*; *Cladosporangium* and *Physoderma* might well be combined, as a series of types passing from one to the other can be traced.

DAHL (A. S.). **Snowmold of turf grasses caused by Fusarium nivale.**—*Phytopath.*, xxiv, 3, pp. 197–214, 5 figs., 1 graph, 1934.

Snow mould (*Calonectria graminicola*) is stated to be responsible for heavy damage to turf grasses on golf courses and the like in the United States and Canada [cf. *R.A.M.*, xii, p. 754], affecting in the United States *Poa pratensis*, *P. annua*, *Agrostis alba*, *A. palustris*, *A. canina*, *A. tenuis* [*A. vulgaris*], and *Festuca rubra*, besides rye, wheat, and barley.

The fungus grows well on oatmeal and potato agar and on sterile grass clippings, but forms spores freely only when the cultures are exposed to diffused light, under the influence of which the colour of the mycelium changes from white to pink. Growth occurred at a range of 2° to 32° C., with an optimum at about 20°. Inoculations on the above-mentioned hosts and oats in moist chambers were most successful at 0° to 5°. Temperature records taken beneath the snow also indicated that the fungus caused infection at about freezing point. Attacks of the disease are promoted by a damp autumn, the falling of snow on unfrozen ground, deep snow, and a prolonged cold, wet spring. The application of organic manure in the late autumn was also found to increase the severity of the disease, the control of which was accomplished, in experiments at Grand Rapids and Minneapolis, by the treatment of the turf in the autumn with mercuric chloride or calomel [mercurous chloride] at the rate of 3 oz. per 1,000 sq. ft., as previously used by Monteith against *Rhizoctonia* [*Corticium*] *solani* [ibid., vi, p. 489].

Differences were observed between the reactions of the various commercial strains of *Agrostis* to snow mould infection, the Colonial and Metropolitan types being much hardier than those of Columbia, while Washington is susceptible but suffers no permanent damage.

Fungus and other diseases of fruit trees.—*Min. of Agric. and Fish. Collected Leaflets* 1, 90 pp., 38 figs., 1934.

These leaflets (collected in portfolio form) issued by the Ministry of Agriculture and Fisheries contain brief, practical notes on the symptoms, causes, and control of a number of common fungal and other diseases of fruit trees in England; they are illustrated with useful plates designed to facilitate diagnosis.

GLOYER (W. O.). **Crown gall and hairy root of Apples in nursery and orchard.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 638, 30 pp., 15 figs., 1934.

This is a progress report of an investigation which was started in 1925 for the purpose of testing the effect of crown gall (*Phytomonas*

[*Bacterium*] *tumefaciens*) and hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xiii, p. 450] on the health, growth, time of fruiting, and yield of infected apple trees under New York orchard conditions. Observations in 1933 showed that the result of root infection of the nursery stock at the time of planting was not uniform for all the varieties tested. Wealthy trees infected with hairy root gave the smallest trees of any group, while the infected McIntosh trees were as good as the controls. Badly galled Baldwin, McIntosh, and Wealthy trees were on the average smaller than the controls. It was found, however, that the height and diameter of the tree were not always an accurate measure of the injurious effect of either disease, other variables such as branch and root pruning, shape and distribution of the root system, and the like, sometimes exerting a greater influence on top growth than the presence or absence of root infection. As a general rule, trees that had a well-developed and healthy root system at the time of planting tended to give the best top growth, while the presence of either crown gall or hairy root tended to produce an abnormal root system, the presence of crown gall invariably tending to cause a girdling effect and inhibiting the formation of roots on the infected side of the tree.

Inspections of apple nurseries in New York showed that the incidence of crown gall has been considerably reduced, as compared to that some ten years ago, owing to the fact that nursery stock is now chiefly propagated by budding instead of by grafting. Budded apple trees, however, may be badly infected when grown in sites heavily infected with crown gall from previous nursery crops, no varietal differences in susceptibility being observable in such cases. Inoculations with *Bact. tumefaciens* on orchard trees showed that the organism may remain latent and not show any visible sign of gall formation until the third growing season.

From a practical point of view, the investigation indicates the disadvantage of planting infected nursery stock, and it is considered that a relaxation or modification of the inspection regulations now in force in New York is not warranted.

MOORE (M. H.). **Spraying and dusting experiments on the control of Apple scab (Venturia inaequalis) and Apple mildew (Podosphaera leucotricha) at East Malling in 1931–1932.**— *Journ. Pomol. and Hort. Science*, xii, 1, pp. 57–79, 4 pl., 1934.

This is a detailed account of the results obtained from continued experiments in 1931 and 1932 at the East Malling Research Station on the control of apple scab (*Venturia inaequalis*) and mildew (*Podosphaera leucotricha*) on Cox's Orange Pippin trees [*R.A.M.*, xii, pp. 297, 767], including a discussion of different methods of expressing and interpreting the tabulated data. Generally speaking, the results largely confirmed those of previous work, although in 1932 the weather conditions were such as to render two preblossom sprays necessary for effective control of apple scab for the first time during the whole period of the investigation. 'Half-strength' (4-18-100) Bordeaux mixture caused no damage in 1932, but gave indifferent control of scab. Colloidal sulphur was found

to be less effective than lime-sulphur, but its effect appeared to depend on the season, since it gave good control in 1931 though not in 1932. The same appeared to be also true of sulphur dust, which proved to be useful at the post-blossom stage as an adjunct to spraying, but was unreliable when used alone both in pre- and post-blossom applications. During the generally wet summer of 1931 additional sulphur dustings afforded good protection against infection, and the indications were that where dusting is practised alone, the number of applications should be increased and they should be made in advance of infection. The best results of all were obtained with lime-sulphur, which gave good control of apple scab and mildew, as well as of red spider [*Paratetranychus pilosus*]; the addition of gelatine, however, somewhat reduced its control of scab. Post-blossom applications of sulphur and lime-sulphur caused fruit drop in 1932 but not in 1931.

There was still further confirmation of the influence of the root-stock on the susceptibility of the leaves and fruit to infection with scab, and some evidence was obtained that the disease may be more easily controlled on trees worked on certain stocks than on others. The severe russeting which was caused in 1932 is considered to be the result of the interaction, on the trees, of soft soap with lead arsenate (or its derivatives) in pre-blossom applications. Some data are also presented on the cumulative effect of previous treatments.

ESMARCH (F.). **Der Nectria-Krebs der Obstbäume.** [The *Nectria* canker of fruit trees.]—*Die Kranke Pflanze*, xi, 2, pp. 15–17, 1 col. pl., 1934.

This is a popular note on the canker of fruit (chiefly apple) trees in Germany caused principally by *Nectria galligena*, occasionally by *N. ditissima* [*R.A.M.*, vii, p. 676]. The symptoms, mode of infection, life-history of the causal organisms, varietal susceptibility, and control of the disease are discussed.

BRIEN (R. M.). **The fungi causing rots of stored Apples in New Zealand.**—*New Zealand Journ. of Agric.*, xlviii, 3, pp. 143–149, 9 figs., 1934.

The author states that isolations in 1931 and 1932 from all the various types of rots which were found on specimens of apples held in cool storage in seven centres in New Zealand, yielded the following fungi: *Penicillium expansum* [*R.A.M.*, xiii, p. 108] (causing an average of 5·6 per cent. infection), *Botrytis cinerea* (16·83 per cent. infection), *Gloeosporium perennans* [ibid., xii, p. 702] (13·9 per cent.), *Gloeosporium* sp. (only isolated from Delicious apples from Auckland, where it caused about 10 per cent. wastage), *Glomerella cingulata* (6·6 per cent.), *Neofabraea malicorticis* [ibid., xii, p. 299] (5 per cent.), *Polyopeus purpureus* var. *verus* [ibid., iii, p. 402] (15·1 per cent.), *Fusarium lateritium* var. *fructigenum* [ibid., xiii, p. 106] (2 per cent.), *Alternaria tenuis* (two specimens only), *Pleospora* sp., *Isaria felina* var. *pirina* [ibid., i, p. 63], *Pullularia pullulans*, *Rhizopus nigricans*, and *Hormodendrum* sp. The five last-named species were found so rarely as to indicate that they are of little economic importance.

The pathogenicity of these fungi was tested in artificial inoculation experiments at the Plant Research Station, Palmerston North, on the varieties Jonathan, Cox's Orange Pippin, Delicious, and Sturmer, and a brief description is given of the type of rot produced by each of them in cool storage.

It is pointed out that during this investigation no sign was found of infection of the stored apples with *Sphaeropsis malorum* [? *Physalospora obtusa*: ibid., iii, p. 274; xiii, p. 313] or *Diaporthe perniciosa*, the occurrence of which in consignments of New Zealand apples at the time of their arrival in England was reported by Mrs. Kidd in 1928 [ibid., ix, p. 41], with a further record for *S. malorum* in 1932 in an unpublished report by Miss Hellinger. *S. malorum* is stated to be exceedingly rare in cool store in New Zealand, and *D. perniciosa* has not yet been collected in the Dominion.

SETH (L. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. V. Analysis of certain chemical factors influencing fungal growth in the Apple.**—*Ann. of Botany*, xlviii, 189, pp. 69–107, 26 graphs, 1934.

The author's investigation [which is fully described, and the results of which are tabulated and expressed graphically] into the effect of change in the concentration of malic acid and sugar, in a standard nutrient medium containing both, upon the rate of radial spread of various fungal strains attacking apples [cf. *R.A.M.*, xii, p. 573] showed that the relation between spread and different combinations of acid and sugar was affected by the strain, the kind and concentration of sugar, and, when mixed sugars were used, by the relative proportions of glucose, sucrose, and fructose.

With *Cytosporina ludibunda* strain CE spread was inversely proportional to malic acid concentration. With *C. ludibunda* strain CC_2 [ibid., xii, p. 378] spread increased with increasing acid or glucose up to an optimum concentration of either and then decreased. In both *C. ludibunda* strain CE and *Phomopsis coneglanensis*, while spread decreased with increasing acid, the curves became increasingly complex as the glucose concentration increased, with a second maximum at the highest glucose concentrations. All the curves in this last system tended to intersect at a point representing a concentration of acid where spread was independent of glucose concentration.

The systems of curves underwent modification when sucrose or fructose or different combinations of glucose, fructose, and sucrose replaced glucose in combination with malic acid. In general, fructose favoured fungal growth at low concentrations of malic acid, but the reverse obtained at higher concentrations.

The curves representing the radial spread of certain strains in relation to the varied chemical composition of media containing nitrogen, malic acid, and sugar in the proportions found by chemical analysis in apples at different times during storage very closely resembled the curves representing the progress of the invasion of fruit tissues by the same strains.

In the media used in the investigation the strains fell into the following groups in order of decreasing rate of spread: (1) *P. citri*,

strain Jaffa 18 and *P. coneglanensis*; (2) *C. ludibunda* strain CE, *Diaporthe perniciosa* strain DHF, *P. citri* strain Brazil 20; (3) *C. ludibunda* strain CA_4 and *D. arctii* [ibid., x, p. 386]; (4) *P. vexans* and *C. ludibunda* strain CC_2. The same order held for power of attacking apples. When the strains in any one group were considered individually, the order varied with increasing acidity of the media. A similar variation also occurred with age of apple (acidity falling with advancing age) and with apple varieties differing in acidity.

ALLEN (T. C.), PINCKARD (J. A.), & RIKER (A. J.). **Frequent association of Phytomonas melophthora with various stages in the life cycle of the Apple maggot, Rhagoletis pomonella.**—*Phytopath.*, xxiv, 3, pp. 228–238, 1 fig., 1934.

Phytomonas [*Pseudomonas*] *melophthora*, the agent of an apple rot in Wisconsin, has frequently been found associated with both male and female adult flies of the apple maggot (*Rhagoletis pomonella*), as well as with the eggs, larvae, and puparia [*R.A.M.*, xi, p. 657]. It has further been detected in the ovipositor punctures, larval burrows, and exit holes of the insects in the apple. The organism was recovered from adult flies and larvae following superficial disinfection.

TANAKA (I.). **Studies on the canker disease of Pear tree caused by Diaporthe ambigua Nitschke.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 85–122, *5–7*, 5 pl., 1934. [Japanese, with English summary.]

Pears (*Pyrus communis*) are stated to suffer severe damage in Hokkaido from canker (*Diaporthe ambigua*) [*R.A.M.*, xi, p. 95], an amended diagnosis of which is given in Latin.

The first symptom of the disease is the formation in the spring of swollen, water-soaked spots on the bark, often accompanied by wilting of the leaves. In June numerous pycnidia of the *Phomopsis* stage of the fungus develop on the infected bark, to be followed in October or in the next spring by the perithecia of *D. ambigua*. A brown line is formed between the healthy and diseased portions of the wood, the host cells along which are filled with a brownish gum. A black line, consisting of the plectenchyma of the fungus, runs irregularly through the affected wood.

The optimum temperature for the germination of the fusiform pycnospores was found to be 25° C. and for that of the ascospores 20°; the thermal death point of the former is 47·5° (five minutes' exposure). The pycnospores succumbed to 20 hours' freezing, which did not, however, prevent ascospore germination. Mycelial growth was most profuse at 22° to 23° (P_H 5·4), the development of the fungus being completely inhibited in the presence of 0·1 per cent. tannic acid. Compared with the white, cottony mycelia of *P. fukushii* [ibid., vii, p. 521] on Japanese pear [*Pyrus serotina*] and *Phomopsis* sp. on Chinese pear [(?) *Pyrus serotina* var.], the imperfect stage of *D. ambigua* makes a slow, compact growth of velvety aspect, thriving in media containing fructose, maltose, or soluble starch as sources of carbon; the last-named was not utilized by the *Phomopsis* from Chinese pear.

TANAKA (I.). **American Gooseberry mildew in Japan.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 123–139, 2 pl., 1934. [Japanese, with English summary.]

In 1927 American gooseberry mildew (*Sphaerotheca mors-uvae*) was observed on *Ribes grossularia* imported from Europe at Kotoni, near Sapporo, Hokkaido, where it had already been noticed by growers in the preceding season. During the next two years the disease spread throughout the province, causing extensive damage; a measure of control, however, has been achieved by five or six applications of lime-sulphur between the opening of the buds and mid-June. *R. hirtellum* has shown a high degree of resistance to *S. mors-uvae* under local conditions, while currants (*R. nigrum* and *R. rubrum*) are immune.

ZELLER (S. M.) & LUND (W. T.). **Yellow rust of Rubus.**—*Phytopath.*, xxiv, 3, pp. 257–265, 1 graph, 1934.

Continuing the studies initiated by the senior writer on the yellow rust of raspberries in Oregon [*R.A.M.*, ix, p. 535], a comparative investigation was made of American, British, and Italian material of *Phragmidium rubi-idaei* [ibid., iii, p. 428], to which the disease is now attributed instead of, as heretofore, to *P. imitans*.

On the susceptible Cuthbert variety in the field the teleutospores first appear early in July, and by October they are so numerous as to form a sooty black layer on the lower leaf surfaces. Attempts to induce germination on living leaves in the greenhouse failed until the following January. Pycnidia were first observed on the new leaves in the field late in March and inoculation experiments showed that they develop 10 to 13 days after greenhouse infection with the teleutospores.

The histological and cytological features of *P. rubi-idaei* were found to agree with Blackman's description of *P. violaceum* (*Ann. of Bot.*, xviii, p. 323, 1904) and Christman's of *P. speciosum* (*Bot. Gaz.*, xxxix, p. 267, 1905), except that in these two species the pycnidia are on the opposite side of the leaf to the aecidia, whereas in the raspberry rust the aecidia immediately surround the pycnidia in a completely encircling sorus. In the early stages of aecidial development the primordial mycelium and buffer and stalk cells are uninucleate, the first binucleate cells apparently occurring in the erect aecidial hyphae.

The sporidia can apparently infect both leaf surfaces irrespective of the stomata, aecidia being generally most common on the upper side in the field. Mature uredosori develop 8 to 13 days after inoculation with aecidiospores and uredospores in the greenhouse, always appearing directly below the stomata on the lower leaf surface only.

In inoculation tests the following proved to be immune: *Rubus laciniatus* (Evergreen blackberry), *R. macropetalus* (North-west trailing blackberry), *R. parviflorus* [*R. nutkanus*] (thimble-berry), *R. spectabilis* (salmon berry), and the Munger and Plum Farmer varieties of *R. occidentalis*. Of the red raspberry varieties (*R. idaeus* and *R. strigosus*) used in the trials, Chief and Latham proved resistant, Lloyd George tolerant, Antwerp, Owasco, and

Seneca moderately resistant, and Ranere, Cayuga, Herbert, Golden Queen, Cuthbert, and Marlboro increasingly susceptible in the order named.

MEHRLICH (F. P.). **Control of Phytophthora heart rot of Pineapple plants.**—*Phytopath.*, xxiv, 3, pp. 173–196, 3 figs., 1 graph, 1934.

A comprehensive, fully tabulated account is given of the writer's experiments with 22 liquid and 12 dry fungicides in the control of *Phytophthora cinnamomi* and *P. parasitica* (taken as including *P. melongenae* Sawada), two of the agents of heart rot of pineapple in Hawaii, *P. palmivora* being the third [*R.A.M.*, xii, p. 303]. The best results were given by dipping the planting material in 1–0·7–3 Bordeaux mixture, the estimated cost of which is $7·00 per acre of 10,000 plants. A single application in eight separate experiments under conditions highly favourable to the disease gave an average control of 80·29 per cent. (range 63·40 to 90·95 per cent.). The average incidence of infection in the adjacent untreated plots was 44·8 per cent. (19·14 to 83·07 per cent.). Full directions are given for the preparation and application of the mixture.

LEWCOCK (H. K.). **Yeasty rot of Pineapples and its control.**—*Queensland Agric. Journ.*, xli, 2, pp. 128–131, 1 fig., 1934.

Pineapples in transit from Queensland to the southern parts of Australia are liable to serious wastage (amounting to 40 per cent. in individual consignments) from attack by species of *Saccharomyces*. The first characteristic symptom of 'yeasty rot' consists in the exudation of bubbles of gas and liquid through cracks in the skin. As fermentation progresses the fruit rapidly loses weight, until it is reduced to a mere shell enclosing a mass of fibrovascular strands. The skin becomes thick, tough, and leathery. No external discoloration occurs until the final stage, when secondary rots frequently induce a brown decay. The flesh of affected pineapples is canary-yellow, stringy, and pitted with large cavities from the skin almost to the core.

Infection, which takes place only when the fruit is ripe and the skin cracked, is favoured by high, and inhibited by low temperatures. Occasional field infections cause no material loss. The incidence of rainfall during growth is the chief factor indirectly limiting the infection that subsequently develops when high temperatures prevail during transport; protracted drought during the growing season causes the fruit to become skin-bound, and if heavy rains fall during ripening time the tissues swell and the skin develops cracks through which the rot organisms effect their entry. In seasons of normal rainfall the disease is comparatively unimportant.

The paper concludes with brief notes on control by improved packing and sanitary methods.

SMALL (C. G.). **Quantitative determination of sulphur on leaves by titration.**—*Phytopath.*, xxiv, 3, pp. 296–299, 1 fig., 1934.

During five years' experimental work on apple spraying and dusting with sulphur fungicides a simpler technique [full details of

which are given] for the quantitative determination of the amount of sulphur adhering to the leaves than those formerly employed [*R.A.M.*, v, p. 311] has been devised. It is based on the volumetric determination of the amount of sodium hydroxide consumed in the oxidization of sulphur to sodium sulphate. The new procedure, while not sufficiently accurate for delicate chemical analyses, appears to be entirely satisfactory for the object in view.

YOUNG (P. A.). **Fungi and bacteria as indicators of the effects of petroleum oils on Apple leaves.**—*Phytopath.*, xxiv, 3, pp. 266–275, 1 fig., 1 graph, 1934.

The following test may be applied to the determination of the toxic effects of oils on apple foliage [*R.A.M.*, xii, p. 29]: agar slant subcultures of *Rhizopus nigricans* are submerged before growth becomes visible in the autoclaved oil to be tested; in some of the tubes nujol or a similar unsulphonatable oil is used while others are kept without oil for comparison. The cultures are then incubated for five days at 20° to 25° C. and the height, sporulation, and extent of spread of the hyphae recorded. Only those oils permitting profuse growth of *Rhizopus* are likely to be sufficiently innocuous for practical use as sprays on apple leaves. Other fungi suitable (though slightly less so than *R. nigricans*) as indicators of the toxicity of oils include *Mucor glomerula* and *Helminthosporium sativum*.

MCDANIEL (A. S.). **Colloidal bentonite-sulfur. A new fungicide.**—*Indus. & Engin. Chem.*, xxvi, 3, pp. 340-345, 3 figs., 1 diag., 1 graph, 1934.

The properties of colloidal bentonite-sulphur (kolofog, koloform, kolodust, kolotex, etc.) [*R.A.M.*, xii, p. 708 *et passim*] are discussed with reference to the essential requisites of an 'ideal' sulphur fungicide. The method of manufacture is described and evidence, claimed to be conclusive, is adduced that the sulphur particles in the new preparation are radically smaller than those of any known commercially obtainable wettable sulphur. The presence of sulphur in an elemental rather than in a compound form insures a wide margin of safety for the plants treated with the above-mentioned preparations, while adhesiveness, wettability, and spreading capacity are guaranteed by the highly gelatinous character of the product.

GALLWITZ (K.), BENZ (T.), & UNGERER (H.). **Untersuchungen an Obstbaumspritzen.** [Investigations on fruit tree spraying apparatus.]—*Tech. Landw.*, xv, 2, pp. 47–49; 3, pp. 60–61, 2 figs., 4 diags., 1934.

Full technical details are given of the construction and application of eight orchard spraying apparatus examined by the writers at the instance of the engineering department of the Baden Farmers' Chamber. On the basis of the resulting judgments the six firms represented were furnished with criticisms embodying proposals for certain improvements.

THOMAS (P. H.). **Stationary spray plants. Success in Tasmania.** —*Fruit World of Australasia*, xxxv, 2, pp. 71–73, 3 figs., 1934.

After stating that there are now over 23 stationary spraying systems [*R.A.M.*, xi, p. 385], mostly of the overhead type [ibid., ix, p. 791], in the orchards of south Tasmania, the author briefly describes the method of installation and operation, and points out that the 'dead end' system [ibid., viii, p. 587], in which the pipes radiate from a main and terminate at the boundaries of the orchard, while cheap to instal, is difficult and wasteful to work as compared with the 'return' system, in which the ends of the pipes are connected with the pumping unit.

The paper terminates with short, practical notes on layout methods.

KOTTE (W.). **Die Aufgabe der Phytopathologie beim Aufbau der türkischen Landwirtschaft.** [The function of phytopathology in the organization of Turkish agriculture.]—*Angew. Bot.*, xvi, 2, pp. 187–201, 1 fig., 2 maps, 1934.

Some general observations are made on the climatic conditions of Turkey, followed by a discussion (based on a two years' stay in the country) of some of the more important phytopathological problems requiring investigation. Necessary preliminaries to the work of plant disease control are the expansion of the phytopathological research stations, the education of agricultural students and officials in phytopathological subjects, and the establishment of an effective plant protection organization.

MACHACEK (J. E.). **A simple method of obtaining Pythium cultures free from bacteria.**—*Phytopath.*, xxiv, 3, pp. 301–303, 1 fig., 1934.

The writer has devised a method, involving the same principle as that of W. Brown (*Ann. of Botany*, xxxviii, p. 401, 1924), for the purification of cultures of *Pythium* from bacterial contamination. The contaminated inoculum is covered with a sterile glass disk, 20 mm. in diameter, and placed on melted potato-dextrose agar, the disk being pressed down to ensure complete contact with the medium. The disk prevents the lateral spread of the bacteria on the surface of the medium while permitting the growth of subsurface hyphae, which begin to emerge from below the disk within a few days. Transfers from the purified mycelium may then be made.

BUTCHER (R. W.). **Zostera. Report on the present condition of Eel Grass on the coasts of England, based on a survey during August to October, 1933.**—*Journ. Conseil. Internat. Explorat. de la Mer*, ix, 1, pp. 49–65, 3 figs., 1 map, 1934.

A brief history of the obscure epidemic involving the wholesale disappearance of eelgrass (*Zostera marina*) in parts of the coastal regions of North America and Europe is given, based on a survey of the relevant literature, correspondence with persons interested in the phenomenon, and observations on the English coasts from

August to October, 1933. In Danish [*R.A.M.*, xiii, p. 317] and Swedish waters, the disease appears to be restricted to certain localities, while no reports of its occurrence have been received from Germany, Norway, or the Mediterranean. As regards England, the writer believes that the gradual dying-out of the grass-wrack seaweeds has been in progress for the last ten years or more, though the rapid destruction of the broad-leaved type (*Z. marina*) would appear to date only from 1931–2. In many cases the amount and nature of the organic matter in the substratum may be a limiting factor in the growth of the eelgrass; *Z. marina* thrives in clean mud and is liable to degeneration in the presence of pollution from oil deposits, decaying refuse, and the like. As the mud becomes fouler the small-leaved forms *Z. nana* and *Z. marina* var. *angustifolia* tend to replace *Z. marina*.

ATANASOFF (D.). **Virus diseases of plants. A bibliography.**—iv + 219 pp., Houdojnik Printing Co., Sofia, 1934.

In a brief preface to this very useful book the author states that its purpose is to present, for the use of students of plant virus diseases, a comprehensive list (compiled to the end of 1932) of the relevant literature that has accumulated in the course of time (some of the references are two hundred years old), much of which is difficult of access or has fallen into oblivion. In its main lines, the list is classified according to the hosts of the virus diseases, with a special section at the beginning of each family of plants to include papers dealing with virus diseases affecting more than one host. The book terminates with an alphabetical index of all the authors cited, and another of the host plants dealt with.

RAYNER (M. C[HEVELEY]). **The mycorrhiza of conifers: a review.**—*Journ. of Ecology*, xxii, 1, pp. 308–312, 1934.

The assumptions of McArdle and Laing [*R.A.M.*, xi, p. 527; xii, p. 183] regarding the relationship between conifers and mycorrhiza are examined and their conclusions as to the lack of positive evidence of a physiological connexion rejected on the basis of the writer's experimental studies of the genus *Pinus* (in preparation for publication) [cf. also xiii, p. 255]. A preliminary summary of these investigations, conducted in Great Britain and the United States, is given.

MENON (K. P. V.). **Studies in the physiology of parasitism. XIV. Comparison of enzymic extracts obtained from various parasitic fungi.**—*Ann. of Botany*, xlviii, 189, pp. 187–210, 28 graphs, 1934.

A full account is given of experiments made to ascertain whether the pectinase enzyme obtainable from one fungus agrees in its properties with that obtainable from another prepared by the same method, either Brown's plate method being used, in which the fungi were germinated in liquid extracts, or a plug method in which pieces of plant tissue were inoculated and subsequently extracted. The enzymic extracts were purified once by precipitation with alcohol, quantitative comparison being made by Brown's mechanical test method. They were then tested as regards (*a*) effect

of P_H concentration on enzyme activity and (*b*) specific retarding action of water, potato, apple, and turnip juices, magnesium sulphate, and potassium phosphate. The fungi used were *Botrytis cinerea*, *Monilia* [*Sclerotinia*] *fructigena*, *Gloeosporium fructigenum*, *Fusarium* [*lateritium* var.] *fructigenum* strain C_2, all parasitic on apple, and *Pythium de Baryanum* and *Phytophthora erythroseptica* parasitic on potato.

The results obtained [which are tabulated, expressed graphically, and fully discussed] while fully confirming the conclusions reached by Chona [*R.A.M.*, xii, p. 184] demonstrated that the same differences of behaviour noted by him as between the enzymes of *Botrytis* and *Pythium* may also be shown by enzymic preparations of the same fungus, according to the method of preparation, from which it may be assumed that the enzyme is the same in all cases, but that certain of its properties are profoundly modified by the adsorption of substances from the nutrient medium. Evidence was obtained that the type of medium used may determine whether any enzyme is formed at all; cultures of *Pythium* and *Phytophthora* grown in various decoctions produced no enzyme, but secreted it freely when grown on plant tissue. A somewhat similar result was obtained with *S. fructigena*. In conclusion, it is suggested that the presence of pectin in the substratum favours the secretion of pectinase enzyme by fungi.

PEYRONEL (B.). **Sur quelques formes de 'Botrytis' du type 'cinerea' produisant un pigment rouge.** [On some forms of *Botrytis* of the *cinerea* type producing a red pigment.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 2, pp. 47–50, 1934.

From a very large series of isolations from some 150 hosts the author obtained 12 different strains of *Botrytis* (of the *B. cinerea* type) producing an abundant red pigment, the intensity of which varied with the strain and the production of which depended strictly upon carbohydrate nutrition. When two different strains were grown in the same dish a more intense pigmentation was set up along the line of demarcation between the colonies, though this did not develop when colonies of the same strain were grown together.

MELIN (E.). **Zur Frage des Antagonismus zwischen frei lebenden Mikroorganismen. Untersuchungen an Holzschliff.** [A contribution to the problem of the antagonism between free living micro-organisms. Investigations on wood shavings.]—*Arch. für Mikrobiol.*, iv, 4, pp. 509–513, 1933.

From wood shavings from 17 sawmills in different parts of Sweden the writer isolated various Torulopsidaceae which proved capable of inhibiting the growth, both on the natural substratum and in malt extract, of certain Dematiaceae occurring in the same habitat, predominantly represented by the blue-staining *Cadophora fastigiata* [*R.A.M.*, xii, p. 69], *Lecythophora lignicola* Nannf., and *Trichosporium heteromorphum* Nannf. (to be described in a forthcoming paper). The inhibitory substances extracted from one of the four types of *Candida* encountered and from a *Torulopsis* were

found to be non-thermostable and incapable of passage through a bacterial filter.

VANDENDRIES (R.). **Le cycle conidien haploïde et diploïde chez les Basidiomycetes.** [The haploid and diploid conidial cycle in the Basidiomycetes.]—*Comptes rendus Acad. des Sciences*, cxcviii, 9, pp. 842–843, 1934.

In addition to *Pholiota aurivella* [*R.A.M.*, xii, p. 186], *Polyporus squamosus* [ibid., ix, p. 81], *Trametes cinnabarina* [ibid., ix, p. 216], and *Pleurotus pinsitus* were found to bear oidiophores with oidia on hyphae showing clamp-connexions and thus belonging to the diploid mycelium. No reversion to the haploid condition, as in the case of *Pholiota aurivella*, was observed in the other species studied. The mycelium arising from a haploid oidium may fuse with a haplont of the opposite sex to produce a fertile diploid mycelium. The innumerable oidia arising from the latter serve to perpetuate the species through successive diploid generations.

RICE (MABEL A.). **The relation of Uromyces caladii and other rusts to their hosts.**—*Bull. Torrey Bot. Club*, lxi, 3, pp. 155–162, 3 pl., 1934.

On the basis of her studies on *Puccinia sorghi* [*P. maydis*] and *Uromyces caladii* [*R.A.M.*, xii, p. 388], the writer controverts Dufrénoy's statement that plasmolysis of the cellular cytoplasm follows haustorial penetration by various parasitic fungi [ibid., ix, p. 122]. Actually the haustorium merely causes the invagination and not the puncture (penetration) of the cytoplasm, the appearance of which is only slightly altered as compared with that of healthy cells. Little evidence was obtained in the writer's investigations of vacuolar fragmentation in infected cells.

CORNET (P.). **Observations cytologiques à propos de Viola hirta parasitée par Puccinia violae (Schum.) D.C.** [Cytological observations in connexion with *Viola hirta* parasitized by *Puccinia violae* (Schum.) DC.]—*Comptes rendus Soc. de Biol.*, cxv, 1, pp. 52–53, 1934.

The cells of *Viola hirta* (in the Lyons district of France) surrounded by the mycelial stroma of *Puccinia violae* [*R.A.M.*, v, p. 669] contain only a few chloroplasts of reduced dimensions (3 to 5 measuring 2·5 by 1·5 μ compared with 13 of 5 by 5 μ in normal plants). Similar observations were made in the cells adjoining those actually in contact with the mycelium. The chloroplasts in the invaded areas were somewhat elongated, possibly in preparation for the process of fusion into moniliform circlets described by Beauverie (*Comptes rendus Acad. Sci.*, clxxii, p. 1195, 1921). The diminution in numbers and size of the chloroplasts of infected cells has also been observed by the writer in several other rusts, which are enumerated.

BURNETT (G.). **The longevity of the latent and veinbanding viruses of Potato in dried plant tissue.**—*Phytopath.*, xxiv, 3, pp. 215–227, 1934.

In a series of inoculation tests at the Washington State College

involving 3,743 Connecticut Havana tobacco and John Baer tomato plants, the latent ('healthy potato') virus [*R.A.M.*, xiii, p. 463], when unmixed with any other virus, was found to retain its infectivity after 286 days' desiccation in the former compared with only 50 days in the latter plant, the corresponding period for potato being 263 days. In a series of experiments with the veinbanding virus alone on 2,355 tobacco plants, infectivity was retained after 50 days' drying in potato and tobacco as against only 17 in tomato. In a further series of trials on 1,510 tomato plants the healthy potato virus in combination with tobacco mosaic (producing tomato streak), remained infective on drying longer than when similarly treated alone, being recovered from potato, tomato, and tobacco foliage after periods of 352, 1,251, and 618 days, respectively.

RUHLAND (W.) & WETZEL (K.). **Zur Physiologie der sogenannten Blattrollkrankheit der Kartoffelpflanze.** [A contribution to the physiology of the so-called leaf roll disease of the Potato plant.]—*Ber. Verhandl. Sächs. Akad. Wiss. Leipzig, Math.-Phys. Kl.*, lxxxv, 3, pp. 141–149, 1933. [Received May, 1934.]

The leaves and tubers (dormant and sprouted) of Alma potato plants suffering from leaf roll were found by Lehmann's and Kerstan's methods (*Planta*, xiii, p. 575, 1931; xvii, p. 491, 1932) to contain a disproportionately high dextrin and low sugar content as compared with healthy ones. Diastatic activity was much lower in the former, accompanied by a reduction of assimilatory capacity, transpiration, and respiration [cf. *R.A.M.*, xii, p. 238; xiii, p. 465].

FOLSOM (D.). **Growing seed Potatoes under an Aster cloth cage.** —*Amer. Potato Journ.*, xi, 3, pp. 65–69, 1934.

Promising results in the growing of seed potatoes free from virus diseases (leaf roll, mosaic, and spindle tuber) in Maine [*R.A.M.*, xii, p. 612] have been given in preliminary experiments by growing the plants under cheesecloth cages such as those used for the protection of asters [*Callistephus chinensis*] in Wisconsin [against yellows: ibid., xi, p. 302]. Directions are given for the construction of a cage, the total cost of which (covering 48 sq. rods, 66 × 198 ft.) is estimated at $240 for the first year and at $140 for each of the second to the fifth years. In 1933 both potato and spinach aphids [*Macrosiphum gei* and *Myzus persicae*] were found in the open field to the extent of 122 per 50 leaves on 24th July, while none could be detected on the corresponding number of leaves on caged plants.

SCHULTZ (E. S.), BONDE (R.), & RALEIGH (W. P.). **Isolated tuber-unit seed plots for the control of Potato virus diseases and blackleg in Northern Maine.**—*Maine Agric. Exper. Stat. Bull.* 370, 32 pp., 8 pl., 2 figs., 1934.

After a brief reference to the economic importance of potato virus diseases in northern Maine, a detailed account is given of experiments on the control of these diseases by roguing in specially established, isolated seed plots at the Aroostook Farm, in which the four seed pieces from one tuber were planted in a group of four adjacent hills in one row, and separated from the next similar

group by an empty space in the row. Six years' continuous experimental roguing in a typical seed plot of Green Mountain potatoes on the farm prevented the increase of the diseases beyond 7 per cent., as compared with an increase of up to 91 per cent. in a neighbouring unrogued field. It was again shown that leaf roll and spindle tuber are easier to control by this method than mild mosaic [*R.A.M.*, vi, p. 248, and above, p. 495], and giant hill [ibid., v, p. 179] was easily eliminated from the plot. Four roguings per season appear to be desirable. Some details are also given of similar small-scale experiments on commercial potato farms and in clearings in the woods, in 12 of which there was an increase in mosaic from one year to the next, while in 12 other cases there was either a decrease or a maintenance of freedom from the disease. In these tests no plot was consistent throughout the two to five years of the experiments, and no one season gave similar results from all the plots. While the location of the seed plots in the wood clearings appeared to favour control to a certain measure, the success or otherwise of roguing did not appear to stand in any connexion with insect records, the distance of the plots from other potatoes, or other similar factors.

It is believed that the relative facility of the control of leaf roll and spindle tuber, as compared to that of mild mosaic, is due to the fact that efficient vectors of the last-named disease are generally more numerous in the region than those of the former two. The paper also contains a discussion of the practical advantages of the tuber-unit method of planting, and some recommendations for effective roguing. Incidentally the work showed that the control of potato blackleg [*Bacillus phytophthorus*] is easier and more nearly complete through planting freshly cut seed pieces, as is usually done in the method described, than through roguing, seed selection, and seed treatment.

The propagation and maintenance of healthy stocks of Potatoes.—*Govt. of Northern Ireland, Min. of Agric. Leaflet* 73, 8 pp., 8 figs., 1934.

To establish potato stocks of a high standard of health the Ministry of Agriculture of Northern Ireland in 1926 initiated a scheme of selection and propagation. In the first year the selections were made chiefly from Arran Victory, the variety most extensively grown, though a few selections were also made from Champion, but later on a start was made with other leading varieties, including Up-to-Date and Majestic.

The method used in the initial stages was to select from growing crops numerous individual plants apparently free from leaf roll and mosaic. The tubers from each plant constituted a separate unit; the various units were planted apart from one another in a turnip crop, at a considerable distance from other potatoes. In the following seasons the healthy produce was planted separately among turnips isolated from potato crops. Small supplies from the healthy units were later distributed for bulk propagation to farmers who agreed to continue to propagate them at a considerable distance from other potato crops, to plant them in fields not sown

to potatoes for at least five years previously, and to rogue out all diseased plants several times a year.

Comparisons of the yields of the selected healthy stocks of Arran Victory and the farmers' own stocks of the same variety made during three years in thirty-three localities showed an average increase in favour of the former of 1 ton 17 cwt. per acre.

In the inspection and certification of potato crops for purity, the Ministry classifies as 'stock seed' any potato crops found on inspection to be (1) practically free from visible mosaic and leaf roll, (2) free from any other disease which might seriously impair the productiveness of the progeny, (3) practically 100 per cent. true to type, and (4) effectively isolated from unhealthy potato crops. In 1933, 142 acres of Arran Victory and 12 acres of Champion were listed as suitable for stock seed, while about 1,000 acres of the former and 200 acres of the latter, as well as large areas of Arran Victory in scheduled districts, were certified as the progeny of stock seed and as of a high standard of health.

VERPLANCKE (G.). **Étude comparative de Pommes de terre d'origines diverses. III. Résultats des expériences faites en 1933.** [A comparative study of Potatoes of various origins. III. Results of experiments made in 1933.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 1, pp. 52–91, 3 graphs, 1934. [Flemish, German, and English summaries.]

Further tests conducted during 1933 in various localities in Belgium of the relative value of certificated seed potatoes of the Industrie variety from Holland and the Ardennes completely confirmed the results previously obtained as to the superiority in respect of degeneration diseases of the former [*R.A.M.*, xii, p. 585]. Observations on the presence of virus diseases showed that leaf roll practically halved the yield, while in some localities the disease increased by 50 to 70 per cent. in one year; in one district leaf roll increased by 15 and 20 per cent. in one year for the Dutch and Belgian plants, respectively. Controlled Ardennes potatoes in one experimental area were 88 per cent. healthy, with 4 per cent. mottling, 3 per cent. mosaic, 1 per cent. leaf roll, and 1 per cent. crinkle, as against 97 per cent. healthy with only leaf roll (1 per cent.) as a serious disease in the Dutch seed.

DUCOMET (V.) & DIEHL (R.). **La culture de la Pomme de terre en montagne et les maladies de dégénérescence.** [Potato cultivation in the mountains and degeneration diseases.]—*Comptes rendus Acad. d'Agric. de France*, xx, 7, pp. 228–238, 1934.

The writers' comparative observations in 1932–3 on Bintje, Institut de Beauvais, Imperia, Cellini, Favoriet × Shamrock 5, and Fin de Siècle × Shamrock 9 potatoes (*a*) at the Central Plant Improvement Station at Versailles, and (*b*) in the mountains at Saint-Nizier (Isère) showed that the influence of the 'degeneration' diseases on yield was at least as marked at the higher altitude as at the lower [*R.A.M.*, xii, p. 56; xiii, p. 390]. The symptoms were more sharply defined in the mountains, while in certain cases, especially among the medium-early and medium-late varieties, the

activity of the insect vectors of virus diseases was much greater in the low-lying situation.

COSTANTIN (J.), MAGROU [J.], BOUGET, & JAUDEL (Mlle V.). **Production expérimentale de mycorhizes chez la Pomme de terre.** [The experimental production of mycorrhiza in the Potato.]—*Comptes rendus Acad. des Sciences,* cxcviii, 13, pp. 1195–1197, 1934.

The roots of two potato (Maréchal Franchet d'Esperey variety) plants, raised from true seed at an altitude of 1,400 m. in the Pyrenees in virgin soil, were found to be profusely provided with a typical endophytic mycorrhiza having arbuscules, sporangioles, and vesicles [cf. *R.A.M.*, xii, p. 310]. In other plants the endophyte was present but had been more or less completely absorbed by the host. Similar but slighter development was found in plants grown from seedlings transferred from the plains when three months old to cultivated mountain soil. In some roots the endophyte closely resembled that found in local *Orobus tuberosus* plants, and it would appear that an identical fungus is capable of contracting a symbiotic relationship with plants belonging to widely separated families.

MACLEOD (D. J.) & HOWATT (J. L.). **Soil treatment in the control of certain soil-borne diseases of Potatoes.**—*Amer. Potato Journ.*, xi, 3, pp. 60–61, 1934.

Since 1928 the writers have obtained good control of potato scab (*Actinomyces scabies*) and black scurf (*Rhizoctonia* [*Corticium*] *solani*) in New Brunswick, Canada, by the addition to the soil of mercuric or mercurous chloride in dry form at the rate of 10 to 15 lb. per acre [*R.A.M.*, xiii, p. 466], diatomaceous and other earths being employed as diluents to facilitate application and ensure uniform distribution. A slight reduction of yield was caused by the fungicides, which were harmless, however, to cereal crops and did not reduce the activity of nitrogen-fixing organisms. Club root of turnips [*Plasmodiophora brassicae*] and certain damping-off diseases of ornamentals also showed signs of yielding to this treatment. Red copper oxide [ibid., xiii, p. 388] was also effective against club root of turnips, while brown heart in the same crop [ibid., xi, p. 276] was controlled by sodium tetraborate (10 lb. per acre).

TAYLOR (C. F.). **Field experiments on Potato-scab control in western New York.**—*Amer. Potato Journ.*, xi, 2, pp. 40–45, 1934.

Further experiments confirmed the increase in the incidence of potato scab [*Actinomyces scabies*] in soils of fairly high P_H values (about 6·0) in western New York following seed treatment with mercurial preparations or the application of the latter to the soil [*R.A.M.*, xii, p. 652]. Spring applications of sulphur after ploughing consistently reduced scab during the past three years, whereas no current season control followed the same treatment before ploughing. Finely ground sulphur proved more effective than inoculated. A pronounced degree of resistance to *A. scabies* was

shown by the Netted Gem, Russet Rural, and White Blossom Irish Cobbler varieties.

BLODGETT (F. M.) & HOWE (F. B.). **Factors influencing the occurrence of Potato scab in New York.**—*Cornell Agric. Exper. Stat. Bull.* 581, 12 pp., 1 fig., 1 map, 2 graphs, 1934.

In a survey carried out in New York State in 1931–2 in which 313 lots each of 100 potatoes were examined in various localities, 13·1 per cent. of the tubers were affected by scab [*Actinomyces scabies*: see preceding abstracts]. The average percentage of infection was generally higher in soils containing much, than in those containing little, lime. When the data were classified on a basis of soil tests made at a depth of three feet it was found that in medium or heavy soil there was more scab in fields with an alkaline, than in those with an acid subsoil, the average amount of scab for the two types of soil being, respectively, 20·1 and 8·9 per cent.; light soils showed no significant difference in the amount of scab present. Infection on soils with a P_H value from 4·3 to 5·4 averaged 5·22 per cent., the figures for those with P_H 7·5 to 8·5 and 5·45 to 7·4 being, respectively, 10·67 and 23·22 per cent. [*R.A.M.*, xii, p. 717]. The maximum scab occurred at about P_H 6·6. Figures [which are tabulated] indicated some indirect relation between elevation and the occurrence of soils favourable to scab, there being significantly more infection at elevations between 400 and 1,200 ft. than at others below or above these limits. If the P_H factor is left out of account as far as possible, the varieties locally grown fall into the following order of increasing susceptibility: Russet Rural, Smooth Rural, Cobbler, Green Mountain, and Up-to-Date.

There was some evidence that less scab occurred when potatoes followed sod than when they followed potatoes or other cultivated crops.

DIPPENAAR (B. J.). **Fusarium-rot in Potatoes.**—*Farming in South Africa*, ix, 95, p. 58, 1 fig., 1934.

A popular note is given on the *Fusarium* tuber rot of potatoes, which is stated to have caused losses amounting to 40 per cent. or more in the seed tubers in the winter rainfall area of the western Cape Province during the last two years [*R.A.M.*, xiii, p. 260]. The exact incidence in South Africa of the various species concerned in the rotting of potatoes is not known, but *F. bulbigenum*, *F. orthoceras*, *F. oxysporum*, and *F. coeruleum* are among those involved. The symptoms of the disease, the conditions favouring infection, the sources of the latter, and control measures are briefly discussed.

KNOBLAUCH (H. C.) & ODLAND (T. E.). **The response of Potatoes to magnesium under various soil conditions.**—*Amer. Potato Journ.*, xi, 2, pp. 35–40, 1934.

Under Rhode Island conditions, the incorporation of magnesium with various phosphorus carriers markedly increased the yields of potatoes on acid soils, where chlorosis due to magnesium deficiency is very prevalent [*R.A.M.*, xii, p. 654]. In one co-operative field

experiment the output was increased by some 100 bushels per acre by the application of magnesium sulphate at the rate of 100 lb. per acre. All the forms of magnesium used in these trials (sulphate, hydrate, and limestone) were found to be equally effective when supplying at least 25 lb. magnesium oxide per acre. For acid soils 25 to 35 lb. magnesium oxide per acre should be mixed with the fertilizer or an occasional top dressing of magnesium limestone given.

SUZUKI (H.). **Studies on an infection-type of Rice diseases analogous to the flower infection. I. On Piricularia oryzae Br. et Cav.**—*Ann. Phytopath. Soc. Japan*, iii, 1, pp. 1–14, 1 fig., 1934. [Japanese, with English summary.]

Inoculation experiments on rice with *Piricularia oryzae* [*R.A.M.*, xiii, pp. 264–267] showed that seed infection may occur before, during, and after the flowering period and the kernel may be infected without any symptoms being visible on the glumes. In cases of severe infection the kernels failed to develop and only the empty glumes were left. There was sometimes little difference in weight between obviously diseased kernels and those of healthy appearance in the inoculated lots (from which the fungus was also reisolated) or the controls. The inoculated seeds were found on microscopic examination to contain the hyphae of *P. oryzae* in the tissues of the embryo, endosperm, bran layers, and glumes, and in some cases both hyphae and conidia were detected between the glume and the kernel. Seedlings arising from sterilized, inoculated kernels on Sachs's nutrient agar soon developed symptoms of blight or rot and died. Germination was not appreciably impaired by inoculation of the seeds with *P. oryzae* at any of the above-mentioned times.

ITO (S.) & IWADARE (S.). **Studies on the red blotch of Rice-grains.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 1–84, *1–3*, 3 pl. (1 col.), 1934. [Japanese, with English summary.]

Two species of *Epicoccum* have been found to cause the 'red blotch' disease of harvested rice grains, associated with a complete loss of germinative capacity, in Hokkaido, Japan, namely, *E. neglectum* [*R.A.M.*, xii, p. 533] and a new species to which the name of *E. oryzae* Ito & Iwadare is given [with a Latin diagnosis]. The new *Epicoccum* is characterized by branched, septate, olivaceous hyphae, 3·7 to 6·2 μ in diameter; globose or subglobose, black, punctiform sporodochia, 45 to 210 μ in diameter; and yellow to olivaceous conidiophores, 2·5 to 7·5 μ long, bearing globose, subglobose, or piriform, granular-verrucose, olivaceous conidia, 9·9 to 23·1 by 6·6 to 16·5 μ, consisting of one to five cells.

Both *E. oryzae* and *E. neglectum* (of which three strains were differentiated) produce a pinkish-red pigment on various standard media, the optimum for this process being below 15° C. for *E. neglectum* A, 23° for *E. neglectum* B, and 25° for *E. neglectum* C and *E. oryzae*. The optimum temperatures for infection were found to be as follows: 14° to 23° for *E. neglectum* B and C, 19° to 23° for *E. neglectum* A, and 14° to 25° for *E. oryzae*. *E. neglectum* was isolated from wheat, oats, maize, beans (*Phaseolus vulgaris*),

and buckwheat, but has shown no power to infect the healthy leaves or stems of any of its hosts.

Under natural conditions the red blotch disease can assume a severe form when the rice plants collapse on to the ground during the later period of growth. Heavy infection further occurred when the plants were laid on the ground or stood upside down in bundles for some days after harvesting, whereas those that were hung up and dried on a bar remained practically free from red blotch. By this simple means, therefore, the serious defect of rice grains herein described may be effectively combated.

Report of the Puerto Rico Agricultural Experiment Station, 1933.—24 pp., 5 figs., 8 graphs, 1 map, 1934.

The following items of phytopathological interest occur in this report. A special survey was undertaken from 1931 to 1933 to determine the mosaic resistance of the Mayaguez 28 sugar-cane variety [*R.A.M.*, xii, p. 394], 14 fields being inspected in seven districts, nearly all in proximity to infected plantings of P.O.J. 36 or Co. 281. It was rare to find more than 3 or 4 per cent. infection on Mayaguez 28, whereas the incidence of the disease increased from a trace to 90 to 100 per cent. in the adjacent fields of susceptible varieties during the period of the observations. Where infection did occur among the Mayaguez 28 canes, the stools were usually completely diseased, indicating that mosaic cuttings had been planted and that secondary spread was negligible. In the Anasco and San German Valley districts, one roguing sufficed to keep the incidence of mosaic as low as 1·5 per cent. where healthy Mayaguez 28 cuttings were selected for planting. The introduction into localities such as Isabela, where mosaic is a limiting factor, of the resistant P.O.J. 2878 and Mayaguez 28 has greatly reduced the heavy expenditure formerly necessitated by replanting the stools of S.C. 12/4 destroyed by the disease. Crosses between P.O.J. 2878 and Mayaguez 28 appear to be commercially resistant to mosaic, comparing favourably with the standard varieties both at Coloso and Aguirre.

Ocfemia (G. O.). **An insect vector of the Fiji disease of Sugar Cane.**—*Amer. Journ. of Botany*, xxi, 3, pp. 113–120, 2 figs., 1934.

Full details are given of controlled experiments at the Los Baños College of Agriculture, Laguna, Philippine Islands, in which the Fiji disease was transmitted by adults of the leafhopper, *Perkinsiella vastatrix*, from infected to healthy shoots of one-node cuttings of P.O.J. sugar-cane grown in insect-proof cages [*R.A.M.*, xiii, p. 182]. The incubation period of the disease ranged from 28 to 86 days. The first symptom of the disease in these tests was the development of minute galls on any part of the lower surface of the leaves and midribs, followed two or three weeks later by shortening of the foliage.

Briton-Jones (H. R.) & Baker (R. E. D.). **Thread blights in Trinidad.**—*Trop. Agriculture*, xi, 3, pp. 55–67, 6 pl., 1934.

After a brief reference to the literature dealing with true thread

blights in tropical regions and in the United States [38 records of which are listed in an appendix], the authors give a brief description of those which they collected in 1933 in Trinidad on various plants. Though fructifications were not found in any, all the forms encountered could be referred on the basis of their mycelial characters to the two categories defined by Petch [*R.A.M.*, iv, p. 67] as *Corticium* and marasmioid thread blights, respectively. Of the seven marasmioid and eight *Corticium* forms that were collected, five and three respectively were isolated and tested in inoculation experiments with pure cultures. The cultural characters of the forms studied [which are shown in a second appendix] indicated that the five marasmioid isolations included three separate fungi which, in all probability, belong to the genus *Marasmius*, this view being supported by the fact that in the form M4 on cacao, immature *Marasmius* fructifications were found on leaf laminae near the threads of the fungus, although apparently not organically connected with the latter. The three isolations of *Corticium* proved to be different from one another; of these, C1 on *Coffea arabica* was identified by the authors as *C. koleroga*, and C2 on grapefruit as *C. stevensii*; the identity of the third isolation (C5) could not be determined, and it may be either a strain of one of the other two, or a separate species. Of the strains of the *Corticium* group not cultured, it is considered fairly safe to identify C6 on *Coffea robusta* as *Corticium koleroga* and C4 on nutmeg as *C. stevensii*, the other three remaining unidentified.

BRITON-JONES (H. R.) & BAKER (R. E. D.). **Notes on some other fungous diseases in Trinidad, 1933.**—*Trop. Agriculture*, xi, 3, pp. 67–68, 2 pl., 1934.

Brief notes are given on four plant pathogenic fungi observed by the authors in Trinidad in 1933 as unusually prevalent, presumably owing to the exceptionally wet conditions. These were a species of *Septobasidium* (possibly *S. pseudopedicellatum*) [*R.A.M.*, x, p. 654] and *Corticium salmonicolor* on grapefruit, *Rhizoctonia* [*Corticium*] *solani* on briar rose, and *Sclerotium rolfsii* on a number of economic plants, including sugar-cane, citrus, tomato, *Tephrosia purpurea*, sunflower, *Crotalaria usaramoenis*, soy-bean, banana (*Musa cavendishii*), *Phaseolus aureus*, and French beans (*P. vulgaris*).

GADD (C. H.). **Report of the Mycologist for 1933.**—*Tea Res. Inst. Ceylon Bull.* 11 (*Ann. Rept. for the year 1933*), pp. 20–25, 1934.

During 1933, tea on one estate in Ceylon was attacked by a previously unobserved *Sphaerulina*, accompanied sometimes by *Colletotrichum camelliae* [*Glomerella cingulata*: *R.A.M.*, x, p. 345]. The attack normally occurred on the leaf margin, though infection was sometimes present near the midrib; the infected area was red-brown, not zoned, and rather brighter than parts attacked by *G. cingulata*. The partly erumpent, black, ovoid perithecia were thinly scattered over both sides of the leaf; the cylindrical to clavate asci measured 69 to 78 by 10 to 12 μ, and contained eight ovate-elliptical, 3-septate, hyaline ascospores, measuring 17 to 20

by 6 μ. Inoculations through wounds with pure cultures of the fungus gave positive results.

Tea branch canker, normally due to *Macrophoma theicola* or its perfect stage *Physalospora neglecta* [ibid., x, p. 760], was associated in certain cases with an Ascomycete (possibly a species of *Leptosphaeria*) having fusoid, multiseptate spores measuring 40 to 45 by 8 to 10 μ; another *Leptosphaeria* with 3-septate spores measuring 12 to 16 by 3 to 4 μ and constricted at the septum was found on one specimen. While no correlation can be established in Ceylon between the incidence of branch canker and that of mosquito blight, as in the similar disease in Nyasaland [ibid., xii, p. 332], there is no conclusive evidence that the fungi constantly associated with the later stages of the former can invade uninjured tissues.

Soil applications of powdered sulphur gave very inconsistent results in the control of witches' broom of tea [ibid., xii, p. 597], and the inclusion of sulphur in a manure mixture had no appreciable effect on the incidence of the disease. Although witches' broom in many respects resembles the yellows disease found in Nyasaland [loc. cit.], the causes of the two conditions are evidently different; the origin of witches' broom in Ceylon remains obscure.

DUGGAR (B. M.) & HOLLAENDER (A.). **Irradiation of plant viruses and of micro-organisms with monochromatic light. I. The virus of typical Tobacco mosaic and Serratia marcescens as influenced by ultraviolet and visible light. II. Resistance to ultraviolet radiation of a plant virus as contrasted with vegetative and spore stages of certain bacteria.**—*Journ. of Bact.*, xxvii, 3, pp. 219–256, 1 fig., 3 diags., 9 graphs, 1934.

The physical installation used in these studies included a quartz monochromator, an intense source of radiation (Daniels-Heidt capillary mercury vapour lamp), a quartz exposure-cell (mechanically stirred), an exposure tank provided with a quartz window, and a sensitive thermopile. Twelve spectral lines or groups of lines were investigated in the range λ 2,537–6,120 Å. The temperature of the exposure was maintained at 1° to 2° C. by means of melting ice. The biological materials consisted of a fresh suspension of semi-purified tobacco mosaic virus [*R.A.M.*, xiii, p. 328], and of *Serratia marcescens* [Chromobactereae] taken from a bouillon culture during the logarithmic growth phase. For the determination both of lethal effects on the bacteria and of inactivation of the virus, materials were combined in the same suspension to obtain comparative values. Dilutions of the bacteria were prepared in physiological salt solution. Poured agar plates were made and the counts gave a quantitative comparison of the irradiated cultures with the unirradiated controls. The percentage inactivation of the virus was determined by the results of inoculations on Wisconsin Havana 142 tobacco plants.

The inactivation of the virus was found to be confined to wavelengths shorter than about λ 3,100 Å, at which point the energy required to produce any perceptible effect is more than 100 times

as much as is necessary at λ 2,652 Å. The energy values representing 100 per cent. bacterial destruction were far below those having any measurable action on the virus, the resistance ratio of the latter to that of *S. marcescens* being of the order of 200:1. The greatest effect on both was at λ 2,652 Å.

In a further series of experiments certain modifications were introduced in the above-mentioned apparatus, especially in respect of the exposure cell. This consisted of an inverted T tube with the horizontal tube cut close to the vertical on each side, the resultant short cylinder at the bottom being closed on each side with a crystalline quartz slip serving as windows. The cell was equipped with a stirrer and a liquid seal. A suspension technique and dilution culture procedure adapted to the requirements of the organisms selected were employed in a study of the resistance of the vegetative and spore stages of *Bacillus subtilis* and *B. megatherium* [*R.A.M.*, xi, p. 318; xiii, p. 233] as compared with that of *S. marcescens* and the tobacco mosaic virus to monochromatic ultraviolet radiation.

The results are expressed in the form of survivor curves for the different wave-lengths and for varying intensities of the wave-lengths employed. It was found that the resistance of the virus irradiated coincidentally and in the same suspension with the bacteria is so much greater as to represent a different order of magnitude.

GRATIA (A.). **Identification sérologique et classification des virus des plantes. Distinction entre l'antigène mosaïque et l'antigène végétal.** [Serological identification and classification of plant viruses. Differentiation between the mosaic and plant antigens.]—*Comptes rendus Soc. de Biol.*, cxv, 11, pp. 1139–1241, 1934.

To the two antigens, namely, normal tobacco and mosaic, present in mosaic tobacco plants [*R.A.M.*, xiii, p. 275] correspond different antibodies in the serum which may be separately adsorbed by fractionated saturation. By this means the writer succeeded both in freeing the anti-mosaic sera from their anti-plant antibodies, and also in separating the flocculable plant element from the mosaic juices.

To concentrated and thoroughly centrifuged mosaic tobacco juice 4 per mille formol was added and the mixture left for six weeks in the autoclave to make an anatoxin or rather an 'anavirus'. A precipitate was gradually formed and settled by degrees, while the supernatant liquid became transparent and colourless. Appropriately diluted and supplemented by the corresponding anti-mosaic serum, a very well-marked specific flocculation was given by the 'anavirus', whereas no such effect followed the addition of a serum prepared against another mosaic. It is thought highly probable that the 'anavirus', injected into rabbits, will furnish excellent anti-mosaic sera devoid of anti-plant antibodies. The present technique should serve to extend the serological method of diagnosis to other plant viruses and possibly also to kindred diseases of animals.

CLAYTON (E. E.). **Toxin produced by Bacterium tabacum and its relation to host range.**—*Journ. Agric. Res.*, xlviii, 5, pp. 411–426, 6 figs., 1934.

This is a detailed account of the author's study of the toxin produced by the tobacco wildfire organism (*Bacterium tabacum*), and of its effect either alone or together with the bacterium on various hosts, including tobacco, a full abstract from which has already been noticed [*R.A.M.*, xii, p. 401].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, v, 8, pp. 222–223, 236–243; 9, pp. 248–250, 261–263, 275, 1934.

BELGIAN CONGO (KATANGA PROVINCE). An Order dated 10th January, 1931, provides that every consignment of seeds, bulbs, or plants imported from any foreign country into Katanga Province, Belgian Congo, shall be accompanied by an officially authenticated certificate of freedom from fungous diseases and insect pests. In the event of detection of fungous or other diseases in the consignments, whether destined to remain in the Province or for transport, the proper authorities must immediately be notified.

AUSTRIA (PROVINCE OF LOWER AUSTRIA). Among the particularly destructive plant diseases and pests to be combated by the Order of 29th November 1933, of the Provincial Government of Lower Austria, supplementing that of 29th May 1931, is black rot of the vine (*Laestadia* [*Guignardia*] *bidwellii*) [*R.A.M.*, xi, p. 416], the detection of which is notifiable to the proper authorities. *Peronospora* [*Plasmopara viticola*], 'roter brenner' [*Pseudopeziza tracheiphila*], *Oidium* [*Uncinula necator*], and other highly contagious diseases of the vine may only be combated by methods approved by the Federal Institute of Plant Protection or the Agricultural Chamber of the Province of Lower Austria.

Junipers infected by trellis rust [*Gymnosporangium sabinae*: ibid., vii, p. 251; viii, p. 796; xi, p. 799] in the vicinity of pear trees must be removed and burnt.

The tips of gooseberry shoots attacked by American mildew [*Sphaerotheca mors-uvae*] must be cut off and burnt in the autumn.

On or before 15th March in each year full particulars concerning the management and organization of all nurseries (other than those of a purely private character) must be furnished to the Lower Austrian Agricultural Chamber, together with the approximate numbers of (*a*) fruit trees, (*b*) soft fruit plants, (*c*) conifers, and (*d*) other trees and shrubs grown. The following diseases in particular will engage the attention of the official inspectors of nurseries and similar establishments: apple mildew [*Podosphaera leucotricha*], American gooseberry mildew [*S. mors-uvae*], leaf curl of peaches [*Taphrina deformans*], scab [of apple and pear: *Venturia inaequalis* and *V. pirina*], and crown gall [*Bacterium tumefaciens*] and canker [*Nectria* spp.] of fruit and other trees. The municipal authority must be apprized of the presence of gooseberry mildew in a nursery.

GERMANY (BAVARIA). By Ministerial Ordinance of 19th January, 1934, steps must be taken before 15th March in each year to cut down all dying or dead fruit trees, together with any suffering to such an extent from fungous or insect attacks that treatment would appear hopeless, while at the same time witches' brooms [*Taphrina cerasi*: ibid., xi, p. 424] must be excised from cherry trees.

OLDENBURG: LÜBECK DISTRICT. As from 15th January, 1934, no barberries may be planted within a radius of 200 m. from cereal stands [with a view to the protection of the latter against *Puccinia graminis*: cf. ibid., xii, p. 736]. The eradication of wild barberries growing within this distance of the nearest cereal stand is incumbent upon the owner of the land.

SAXONY. The third (9th September 1933) and fourth (14th February, 1934) revisions of the Order for the prevention of the spread of potato wart [*Synchytrium endobioticum*] of 3rd July 1928 [cf. ibid., viii, p. 664; ix, p. 816] introduce certain modifications of the regulations, the main provisions of which are now as follows. No potatoes may be cultivated within a period of ten years on any plot found to bear diseased plants. For eight years (beginning at the latest with the commencement of the next year but one after the detection of infection) only the officially authorized wart-resistant ('field-immune') potato varieties (lists of which are issued regularly by the German Plant Protection Service) may be grown on plots under the same agricultural or horticultural management as those found to be infested. Plots of less than 1,000 sq. m. in extent are to be planted exclusively with wart-resistant varieties. As from 1st January 1932 (in the absence of contrary provisions arising out of the foregoing) only wart-resistant varieties may be cultivated in the Dresden, Leipzig, Coswig, and Cossebaude districts.

SOUTHERN RHODESIA. Government Notice No. 130 of 24th February, 1933, prohibits the importation into Southern Rhodesia of citrus trees, fruits, and dried peel from Mozambique Territory on account of plant diseases [especially citrus canker, *Pseudomonas citri*: cf. ibid., xiii, p. 64].

Legislative and administrative measures. Madagascar and Dependencies.—*Internat. Bull. of Plant Protect.*, viii, 3, p. 56, 1934.

As from 14th December 1933, the Comoro Islands, Madagascar, have been declared infected by sugar-cane mosaic, and any exportation of plants, cuttings, and seed of this crop from the diseased area to other parts of the territory of Madagascar and its Dependencies is prohibited.

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BIRKELAND (J. M.). **Serological studies of plant viruses.**—*Bot. Gaz.*, xcv, 3, pp. 419–436, 1934.

A fully tabulated account is given of the writer's precipitin tests for the differentiation of certain tobacco viruses, namely, spot necrosis (Johnson's tobacco virus IV), ring spot (tobacco virus V), ordinary mosaic (tobacco virus I), and attenuated forms of spot necrosis and mosaic, as well as tomato and cucumber mosaic [*R.A.M.*, xiii, pp. 328–331].

The juice from virus-diseased plants was found to contain, besides the antigenic constituents of a healthy plant, an antigenic fraction inseparable, by the methods of purification employed (including passage through a Seitz filter), from the virus itself [ibid., xiii, p. 542]. This applied in the case of tobacco virus I whether the virus was grown in tobacco or tomato. The antigenic factor not only accompanies the virus but is specific for a particular one, as shown by the qualitative differences between the antibodies of one virus and those of another. The close association of the antigenic factor with infectivity and the specific nature of the antigenic fractions accompanying the different viruses strongly suggest that the factor in question is either the virus itself or a virus-plant protein complex in which the former acts as a haptene.

MANDELSON (L. F.). **Barn spot of Tobacco. Preliminary investigations and flue-curing experiments.**—*Queensland Agric. Journ.*, xli, 2, pp. 132–147, 1 fig., 1 diag., 3 graphs, 1934.

Investigations carried out in Queensland showed that the optimum, maximum, and minimum temperatures for the growth of *Cercospora nicotianae*, the causal organism of barn spot of tobacco [*R.A.M.*, xiii, p. 277], on potato dextrose agar were, respectively, about 78·8°, 93°, and 45·5° F. As the disease may develop in the curing shed at temperatures over this maximum the spots are probably due not to fungal growth at the time of curing but to the reaction of cells infected in the field. Humidity studies indicated that the development of the spotting varied, up to a point, directly with the relative humidity of the atmosphere in which the leaf is coloured, though fewer spots developed in a saturated atmosphere than in one of 90 per cent. relative humidity. The more mature the leaf tissue the more liable it was to spot.

Leaf flue-cured in a barn where the temperature varied from 98°

to 108° and where the relative humidity for fourteen hours out of the first twenty-four was 96 per cent. or over, developed considerably less barn spot than similar leaf cured in the normal way.

Further experiments are to be undertaken.

DESAI (S. V.). **Studies on the nature of the causative agent of the mosaic disease of Tomatoes.**—*Indian Journ. Agric. Sci.*, iii, 4, pp. 626–638, 4 pl. (1 col.), 1933. [Received June, 1934.]

In December, 1931, tomatoes at Pusa developed mosaic symptoms, the plants being stunted and the young leaves small, crinkled, deformed, and marked with yellow patches. The mature leaves remained apparently healthy (though some showed very small necrotic areas), but those not quite mature when infection first appeared developed characteristic markings later.

Attempts to isolate an organism from the diseased tissues gave negative results, and the filtrate from the tomato extract broth in which material of the diseased tissues had been crushed and incubated was used as a stock material for virus studies. To ascertain whether the virus acted as a bacteriophage on organisms present in the plant or in the soil, affected tissues were crushed in nutrient broth, incubated for sixteen hours, and then plated. Five bacterial isolates thus obtained were selected for testing the action of the virus. To young cultures of the organisms 0·2 c.c. of the stock virus filtrate was added, the suspensions then being incubated for five days at 30° C. This process was repeated for ten serial transfers, but no action resembling that of a bacteriophage was detected. Twenty-four representative colonies of organisms isolated from soil, as well as 12 named stock cultures of soil organisms, were similarly tested with the stock virus filtrate by serial passages, again with negative results.

Stems of diseased tomato plants were thoroughly sterilized in 1 in 1,000 mercuric chloride at 37° *in vacuo* for ten minutes. The tissues were repeatedly washed, transferred to a Petri dish, cut lengthwise, and planted on to tomato extract agar slants, after which they were incubated for a long period at 30°. Some of the tubes showed growth after a week and others after one month, all the growths being identical and all showing circular transparent areas. Transfers showed the same transparent areas which were attributed to an associated bacteriophage, but as all attempts to obtain ultra-pure cultures failed, no progress could be made with the study of the bacteriophage, since an increase in virulence could not be brought about.

When 0·1 c.c. of the stock virus filtrate was added to a fresh suspension of the organism isolated from the diseased tissues slight limpidity resulted, indicating the dissolution or flocculation of the bacteria. From the evidence obtained the virus is regarded as possibly a filterable cyclostage in the life-history of the organism.

Inoculations (by scratching the leaves) of young, healthy tomato plants with a suspension of the 8th and 15th serial transfers of the virus in association with the bacterium isolated from the plants filtration being performed before each transfer and 0·1 c.c. of the filtrate added to a fresh bacterial suspension, gave positive results in ten and seven days, respectively, the type of mosaic produced by

the 15th transfer on one plant being very severe. Older plants in insect-proof cages when inoculated with a suspension of the 22nd serial transfer developed typical mosaic in six weeks. The concentration of the original virus extract was 1×10^{-16}, 1×10^{-30}, and 1×10^{-44}, respectively for the 8th, 15th, and 22nd transfers used in these experiments, a dilution precluding any possibility of infective quantities of the original virus having been carried over, and indicating a multiplication of the virus in the presence of the bacterium.

Not only the inoculated leaves but also the stems and petioles of the uninoculated leaves almost invariably contained the same bacterial organism, though none could be isolated from the leaves, stems, and petioles of the controls. From these results the author concludes that the bacteria are in some way connected with the production of the disease.

CIFERRI (R.) & BALDACCI (E.). **Sulle batteriosi, fusariosi, geotricosi e sul marciume apicale (blossom-end rot) dei frutti di Pomodore.** [On bacteriosis, fusariosis, geotrichosis, and blossom-end rot of Tomato fruits.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 204–280, 27 figs., 1933. [Latin summary. Received May, 1934.]

In this paper the authors give a detailed description of their investigation into blossom-end rot of tomatoes [*R.A.M.*, xii, p. 733], in the course of which they isolated from affected material *Fusarium erubescens*, *Penicillium italicum*, and a bacterium (the morphological and cultural characters of which are described), inoculations with all of which failed to produce typical symptoms either on tomatoes or numerous other hosts. Attempts were then made to establish the pathogenicity of various fungi and bacteria, and a list is given of fungi found in different naturally-occurring tomato rots, none of which causes symptoms resembling true blossom-end rot. Of these, the most frequently encountered was the watery rot caused by *Geotrichum lactis* (*Oospora lactis* or *O. lactis-parasitica*) [ibid., viii, p. 140]. The results obtained are fully discussed with numerous references to the relevant literature, and it is concluded that the disease is due to physiological disturbances. A bibliography of 171 titles is appended.

FAWCETT (EDNA H.) & BRYAN (MARY K.). **Color in relation to virulence in Aplanobacter michiganense.**—*Phytopath.*, xxiv, 3, pp. 308–309, 1934.

The pink form of *Aplanobacter michiganense*, the agent of tomato canker, was consistently found to suffer more from adverse environmental conditions than the yellow or white strains arising from it [*R.A.M.*, x, p. 415], having even been rendered non-virulent in many cases. Both rough and smooth colonies occur within any given colour strain, and the pink one has been found to produce transitional salmon, buff, and pale to deep orange forms combining the qualities of roughness and smoothness and apparently representing blends of pink, yellow, and white.

RAMSEY (G. B.). **Pleospora lycopersici E. and E. March., a Tomato pathogen in the United States.**—*Science*, N.S., lxxix, 2048, p. 294, 1934.

Since 1919 Californian tomato stocks have undergone extensive damage, involving losses of 50 to 90 per cent., from *Pleospora lycopersici* E. and E. Marchal [*R.A.M.*, i, p. 62], which does not appear to have been previously identified in the United States. In the early stages brown V-shaped to oval, fairly dry lesions round the stem scar are characteristic symptoms; as the fruits ripen the lesions soften and the black perithecia of the fungus appear in the centre. The conidial stage, *Macrosporium sarcinaeforme* [ibid., xi, p. 377], is also present on the same material. Single ascospores and conidia gave rise to cultures bearing both the perfect and imperfect stages. The average dimensions of *P. lycopersici* on Californian tomatoes are as follows: perithecia 325 to 550 μ in diameter, asci 167 by 28·2 μ, ascospores 34·4 by 15·2 μ, and conidia 26 by 13·5 μ.

WAGER (V. A.). **Fusarium wilt in Tomatoes. Research work in the Eastern Transvaal.**—*Farming in South Africa*, ix, 95, pp. 61–63, 5 figs., 1934.

Popular notes are given on the symptoms, etiology, spread of infection, and control of tomato wilt due to *Fusarium bulbigenum* f. 1 (syn. *F. lycopersici*), with special reference to the work of breeding for resistance now in progress at Nelspruit, Eastern Transvaal [*R.A.M.*, xiii, p. 194].

SCHWARZ (H.). **Das Ulmensterben und sein Erreger.** [The die-back of Elms and its agent.]—*Oesterr. Vierteljahresschr. für Forstwesen*, lxxxiv, 1, pp. 15–18, 1934.

It is estimated that, since the first detection of elm die-back (*Ceratostomella ulmi*) in Austria in 1926 [*R.A.M.*, xi, p. 755], about half the entire stand has been destroyed by the disease [the available information on which is briefly summarized]. Contributory factors in the rapid spread of the disease include the recent succession of dry summers, the sinking of the ground water level, and damage inflicted by the severe winter of 1928–9 and by hoar frosts in 1933. There is considered to be little hope of saving the remaining trees, at any rate by direct control, though an improvement in the situation might be effected by combating the bark beetles (*Scolytus* spp. and *Pteleobius vittatus*) implicated in the transmission of the fungus [see next abstract].

BUISMAN (CHRISTINE). **Verslag van de onderzoekingen over de Iepenziekte, verricht in het Phytopathologisch Laboratorium Willie Commelin Scholten te Baarn gedurende 1933.** [Report of the investigations on the Elm disease conducted in the Phytopathological Laboratory 'Willie Commelin Scholten' at Baarn during 1933.]—*Tijdschr. over Plantenziekten*, xl, 3, pp. 65–87, 1934.

With the help of Miss J. C. Went, the writer pursued her studies on the reaction of a number of European and Asiatic elm species and varieties to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xii,

p. 665] in 1933, during which year the die-back occurred in a very severe form in Holland, necessitating the felling of some 70,000 trees, and spreading to new districts. An inspection of the Wadden Islands revealed the combined presence of *C. ulmi* and the elm bark beetles (*Scolytus scolytus* and *S. multistriatus*) on all except Vlieland. Except on Ameland, where 16 cases were observed, the disease is still in the sporadic stage on these islands, where its spread may be arrested by an energetic felling campaign.

Among the European elms, *Ulmus procera monumentalis* and *U.p. berardi* maintained the resistance shown in previous trials, while two varieties of *U. foliacea, sowerbyi* and *hillieri*, were little affected by inoculation. *U. foliacea dampieri* and *U. glabra fastigiata*, which do not suffer much from die-back in the field, often contract infection readily on artificial inoculation. Of the Asiatic species and varieties tested, *U. japonica, U. laciniata nikkoense*, the Karagatch elm, and *U.* sp. from Central Asia reacted positively to inoculation with *C. ulmi*, while *U. wilsoniana, U. macrocarpa*, and *U. pumila* were also somewhat susceptible; *U. pumila pinnato-ramosa*, on the other hand, showed no sign of infection. Two cases of spontaneous infection in *U. pumila* were observed at Amersfoort in 1933, the fungus being isolated from the diseased branches, which had been injured by the gnawing of bark beetles. Both the trees had been grafted high up on Dutch elms (*U. hollandica*), providing a further example of the inadvisability of high grafting with the Asiatic species.

A special series of tests to determine the correct period for successful inoculation showed that, with few exceptions, the chance of positive results increases from the middle of April to the end of May, after which it is likely to decline. Inoculation experiments with spore suspensions of the die-back fungus were successful only on wounded branches. From a diseased elm bark beetle used in feeding tests at Haarlem *Beauveria bassiana* [ibid., xiii, p. 94] was isolated.

Kort verslag van het Iepenziekte-onderzoek, verricht op het Phytopthologisch Laboratorium Willie Commelin Scholten te Baarn, gedurende 1933. [A short report on the Elm disease investigation conducted at the Phytopathological Laboratory 'Willie Commelin Scholten' at Baarn during 1933.]—*Tijdschr. over Plantenziekten*, xl, 3, pp. 88–90, 1934.

The inoculation experiments on elms (totalling about 3,400) with *Graphium* [*Ceratostomella*] *ulmi* [of which particulars are given in the preceding abstract] were carried out in 1933 in five Dutch towns, viz., Baarn, Utrecht, The Hague, Haarlem, and Amersfoort. Lectures were given on the disease by Drs. Westerdijk and Buisman and exhibits of infected material displayed.

TE WECHEL (A.). **Houtverlies tengevolge van het schillen van Iepenhout op de opslagplaatsen.** [Loss of wood in consequence of the scaling of Elm wood at the felling sites.]—*Nederl. Boschbouw-Tijdschr.*, vii, 3, pp. 64–72, 3 figs., 1 diag., 1934.

At the instance of the committee for the study and control of

the elm disease [*Ceratostomella ulmi*: see preceding abstracts], the writer investigated the loss of merchantable timber resulting from the decortication of the trees in accordance with the recent enactment of the Dutch Government [*R.A.M.*, xiii, p. 352]. It was found that, where proper care is exercised and the decorticated logs are kept under mats or otherwise suitably protected from the sun, such shrinkage need not exceed 2·7 per cent. of the total weight, but it may easily amount to 10 per cent. where due precautions are neglected.

Nochmals: Der Ulmentod besiegt? [Once again: is the die-back of Elms overcome?]—*Deutsche Landw. Presse*, lxi, 13, p. 154, 1934.

To correct misleading announcements in the press the National Biological Institute, Berlin-Dahlem, states that attempts are in progress to protect healthy, susceptible elms against the elm die-back [*Ceratostomella ulmi*: *R.A.M.*, xii, p. 578] by grafting on to them two Asiatic varieties of established capacity for resistance. The ultimate efficacy of this method, however, remains to be proved.

[This announcement also appears in *Blumen- und Pflanzenbau*, xxxviii, 15, p. 199, 1934.]

BROEKHUIJSEN (M. J.). **Wilgenkanker, veroorzaakt door Discella carbonacea (Fries) Berk. et Br.** [Willow canker caused by *Discella carbonacea* (Fries) Berk. et Br.]—*Tijdschr. over Plantenziekten*, xl, 2, pp. 62–63, 1 pl., 1934.

In March, 1933, willow (*Salix viminalis*) branches from an experimental field were examined at Wageningen and found to bear diffuse, brownish-green, rapidly spreading lesions with darker-coloured protuberances containing the flat, lentiform pycnidia and uniseptate pycnospores on short, simple conidiophores of *Discella carbonacea* [*R.A.M.*, ii, p. 94; xi, p. 423]. Inoculation experiments on healthy willow branches gave positive results and the organism was readily reisolated from the diseased material. The perithecia of *Physalospora salicis* [loc. cit.] were also observed forming sub-epidermal black spots on the dead tips of the willow branches from the above-mentioned experimental field.

SREENIVASAYA (M.). **Insect transmission of spike disease.**—*Nature*, cxxxiii, 3358, p. 382, 1934.

Attention is drawn to the importance of differentiating between the non-infectious stunting of sandal [*Santalum album*] in South India due to adverse environmental conditions and the highly infectious and destructive spike disease. Experiments showed that the former trouble, unlike the latter, is not transmissible by grafting and that affected trees, on provision of fresh soil and a new host, make a complete recovery. The recent report of positive results in spike transmission tests with *Moonia albimaculata* [*R.A.M.*, xiii, p. 198] is believed to be based on failure to distinguish between these two types of disturbance.

SMITH (C. O.). **Olive knot on Olea chrysophylla.**—*Phytopath.*, xxiv, 3, pp. 307–308, 1 fig., 1934.

Olea chrysophylla, a native of the East African highlands, was successfully inoculated at Riverside, California, with the olive knot organism, *Bacterium* [*Pseudomonas*] *savastanoi* [*R.A.M.*, xii, p. 458], which was reisolated from the resulting knots. The latter are smaller, less globose, and rougher or more irregular in form than those occurring on the olive, being more like those caused by *P. savastanoi* on *Fraxinus*, *Forestieria*, and *Osmanthus* [ibid., ii, p. 12].

KAWAMURA (E.). **Bacterial blight of Chestnut.**—*Ann. Phytopath. Soc. Japan*, iii, 1, pp. 15–21, 2 pl., 1934. [Japanese, with English summary.]

Bacterium castaneae n.sp., the agent of a disease of chestnuts in Fukuoka, Japan, is a short rod measuring 1 to 1·8 by 0·8 to 1·2 μ, occurring singly or in pairs, motile by one to five polar flagella, Gram-negative, forming neither spores nor capsules, and facultatively anaerobic. On beef agar it forms white, round, slightly undulate, viscid colonies, which assume a radiately rugose aspect on potato agar; gelatine is liquefied, milk peptonized but not coagulated, nitrate and methylene blue reduced, and acid produced from dextrose, saccharose, and glycerine (but not lactose) without gas. The minimum, optimum, and maximum temperatures for growth are below 3°, 25° to 27°, and 35° C., respectively, with a thermal death point between 50° and 51°.

The first symptom of infection with the bacterial blight caused by this organism is a water-soaked spotting of the foliage and young shoots. In the latter, in which and in the buds the disease is most conspicuous, the cortical parenchyma is destroyed with the formation of bacterial cavities, and brown fissures subsequently develop. Similar lesions occur on the petioles and main veins. On young leaves the pathogen causes distortion, and the leaves of infected buds shrivel and die.

RUDOLPH (B. A.). **Bacteriosis (blight) of the English Walnut in California and its control.**—*California Agric. Exper. Stat. Bull.* 564, 88 pp., 17 figs., 1933. [Received May, 1934.]

In the first part of this bulletin the author gives a brief historical, morphological, and biological account of walnut blight and its cause (*Bacterium juglandis*) [*R.A.M.*, xiii, p. 409]—the symptoms being described in detail; in an outline of the geographical distribution of the disease he considers that the 'mal secco' or 'mal nero' disease in Italy attributed by Savastano to *Bact. juglandis* [ibid., iii, p. 524] is not true blight [ibid., xiii, p. 336].

A summarized account is given of the results of large-scale spraying experiments since 1927 in California, which indicate that under the conditions usually prevailing in that State 8-4-50 Bordeaux mixture is the most satisfactory spray for the control of the disease, and that a pre-bloom application is absolutely necessary, as its omission is almost certain to result in heavy infection. While no definite conclusion could be drawn as to the exact date when the second spray should be applied, experimental

data and personal observations indicate that an application immediately after the nuts are set is likely to give better control than a later one; ordinarily, sprays applied in June are of little value, as by that time the rainy season is usually over in California.

For average working conditions in the State, the cost of materials and of application is estimated at 2 cents per gall. of Bordeaux mixture of the given strength, this estimate being stated to be rather on the generous side. Each tree requires, according to size, from 10 to 30 galls. of spray fluid at each application, of which two or three (sometimes more) are necessary. Even at this high figure, the profit of the treatment was calculated to have amounted in certain concrete cases to anything from one to six dollars per tree, depending on the season and on the size of the trees. It is pointed out, however, that in certain cases some loss was incurred, chiefly due to the undesirable effect of the spray on nut sizes resulting from the overloading of the treated trees.

THOMAS (H. E.). **Studies on Armillaria mellea (Vahl) Quél., infection, parasitism, and host resistance.**—*Journ. Agric. Res.*, xlviii, 3, pp. 187–218, 11 pl., 1934.

This is a detailed and fully illustrated account of the author's study of the mode of entrance and subsequent development of *Armillaria mellea* in the roots of walnut (*Juglans regia*), northern California black walnut (*J. hindsii*), peach, pear, and cherry plum or myrobalan (*Prunus cerasifera*) [*P. divaricata*] seedlings, and in carrots, parsnips, dahlias, and potatoes, field observations having indicated that the relative susceptibility of these hosts ranges from high susceptibility in the walnut and peach to high resistance in the pear and black walnut. It was shown that in all these hosts penetration by the parasite was effected directly through the healthy unwounded periderm, at points where the advancing ends of subterranean rhizomorphs [*R.A.M.*, xiii, p. 483] became securely attached to the surface of the root or tuber by means, in part at least, of the mucilaginous substance enveloping the rhizomorph close behind its white tip. At this point the rhizomorph produces one or more branch rhizomorphs, originating in its inner cortical cells, which enter the host as a whole partly by mechanical and partly by chemical action, since there appeared to be some destruction of the suberized walls of the host cells, indicating the possible effect of a suberin-digesting enzyme. Further advance of the invading rhizomorph is preceded in all the hosts by the death of the cells, the advance killing being more extensive in susceptible than in resistant plants. After entry in the former, the invading rhizomorph grows and branches rapidly, and causes general destruction of the surrounding tissue by means of side hyphae which emerge from near its base in a direction perpendicular to its surface, and which follow but do not precede the advancing rhizomorph. In resistant roots, the fungus is unable to establish itself and usually destroys but little of the affected root, the wounds caused by it being either cut off by cork or healing over. Cork formation is induced also in the susceptible hosts (except the potato), but is not constant in either group. Furthermore, the fungus was shown to be readily capable of breaking through

secondary cork barriers, and this, coupled with the fact that in some instances small lesions were found in pear roots, in which the advance of the rhizomorph had been apparently arrested without the formation of cork around it, renders the significance of cork as a factor in resistance doubtful.

The paper also contains a description of the wound gum which was observed in the borders of the lesions in some of the hosts, especially in the walnut and cherry plum, and also of the gum cavities which are of almost constant occurrence in species of *Prunus* affected by *A. mellea*. In a special series of tests it was shown that the fungus grew well on the expressed sap of certain roots, and poorly or not at all on that of other roots, but there seemed to be little correlation between the inhibition of growth in this manner and resistance of the living host. There was also some evidence that structural or morphological differences of the hosts exert little influence on resistance to *A. mellea*, which would appear to be of the nature of an antagonistic influence on the fungus exerted by the host only when the latter is in an active, healthy condition.

New Zealand. State Forest Service. Annual Report of the Director of Forestry for the year ended 31st March, 1933. —15 pp., 1933. [Received 1934.]

The following items of phytopathological interest occur in this report. Pine wilt (*Phomopsis strobi*) is widespread on *Pinus radiata*, *P. muricata*, and *P. canariensis*, chiefly at high altitudes. *Diplodia pinea* [*R.A.M.*, xiii, p. 426] is ubiquitous as a saprophyte, but becomes parasitic, causing die-back, under unsuitable environmental conditions. A secondary effect of this fungus is a bad discoloration of the timber even where the health of the trees is little impaired. Root rot (*Armillaria*) [*mellea*] is of minor importance on exotic pines in cut-over indigenous forest areas. Needle fusion is an obscure disturbance well known in Australia [ibid., xiii, p. 356] on exotic species but only recently detected in the Auckland district of New Zealand.

HAHN (G. G.) & AYERS (T. T.). **Dasyscyphae on conifers in North America. II. D. ellisiana.**—*Mycologia*, xxvi, 2, pp. 167–180, 3 pl., 1934.

A taxonomic study of *Dasyscypha ellisiana* [*R.A.M.*, xii, p. 733], commonly found associated with *D. willkommii* [ibid., xiii, p. 482], on the blue form [var. *glauca*] of *Pseudotsuga taxifolia* attacked by European larch canker in New England and elsewhere, has shown the first-named to be an indigenous species. First collected in 1831 by Schweinitz, who recorded it as *Peziza calycina* Fr., *D. ellisiana* has generally been regarded as a saprophyte, but recent observations indicate that it has assumed a parasitic form on four introduced species in New England, namely, *P. taxifolia* var. *glauca*, *Pinus ponderosa*, *P. flexilis*, and *P. cembra*.

Taxonomic confusion has frequently arisen between *D. ellisiana* and *D. lachnoderma* (Berk.) Rehm, a non-coniferous Discomycete from Tasmania, but these two species, as Massee pointed out (*Journ. Linn. Soc.*, xxxi, p. 503, 1895–7), are quite distinct. The

writers' comparative morphological studies [details of which are given] on the two fungi under discussion confirmed Massee's opinion and further indicated the desirability of transferring *D. lachnoderma* to the genus *Lachnum*, on account of its broad, acerose paraphyses, as *L. lachnoderma* (Berk.) comb. nov. *D. ellisiana*, on the other hand, appears to represent a transitional stage between the forms with filamentous paraphyses and those producing broad, lanciform structures, and should consequently be retained within the genus *Dasyscypha*. An amended description of this fungus is given in which the imperfect stage is reported for the first time, consisting of an erumpent stroma, 106 to 132 μ in diameter, closed at first, then opening with a single exposed chamber, or compound, with more than one locule, 243 to 433 μ in diameter; fusiform conidia, 5 to 5·8 by 0·9 to 1·2 μ, are abstricted from the tips of short, subulate, acute, simple or verticillately branched conidiophores. *D. ellisiana* has been found along the coast from Maine to Texas on 15 species of *Pinus* as well as on Douglas fir, larch (*Larix europaea* and *L. leptolepis*), and spruce (*Picea engelmanni*).

Rohde (T.). **Das weitere Vordringen der Rhabdoclineschütte in Deutschland.** [The further advance of the *Rhabdocline* leaf fall in Germany.]—*Forstarchiv*, x, 5, pp. 68–69, 1 map, 1934.

The present position of the leaf fall (*Rhabdocline*) [*pseudotsugae*] of Douglas fir [*Pseudotsuga taxifolia*] in Germany [*R.A.M.*, xiii, p. 482] is briefly indicated. In the west the disease extends in all probability from Flensburg to Trier [Treves], infection in some cases being traceable as far back as 1925. The eastern centres of infection all appear to be of recent date, and it is stated that one has been detected in Poland. The total number of localities from which *R. pseudotsugae* has been recorded so far is 114, but the list is stated to be far from complete, especially as regards the eastern districts.

Dodge (B. O.). **Gymnosporangium myricatum in relation to host parenchyma strands.**—*Mycologia*, xxvi, 2, pp. 181–190, 2 pl., 2 figs., 1934.

A full account is given of the mode of penetration of *Gymnosporangium myricatum*, the agent of a destructive witches' broom disease of *Chamaecyparis thyoides* in New York, into its host. Infection appears to take place first near the tip of a shoot, the green tip of the main axis becoming infected through the leaves before cork formation begins. The hyphae extend to the centre of the twig and also longitudinally in fascicles or synnemata which may become cut off by a meristem formation around the strand; from this meristem tracheids arise. Before the meristems form there is usually a multiplication of the thin-walled parenchyma, containing haustoria, of the cortex or medullary rays. Thus the fungus seems to run in a strand of parenchyma, simulating an intrusive growth. Each hyphal cell is binucleate. A thin haustorial thread invades the wall of the host cell and forms the haustorium, which almost reaches maturity without a nucleus but eventually acquires the two from the mother cell. The parenchyma strands

never invade the wood rings, their occasional apparent occurrence in which denotes that they have had wood laid down around them.

Young seedlings or branches attacked in the growing region are liable to permanent dwarfing and premature death, the latter effect also frequently following the profuse formation of witches' brooms on large trees.

DODGE (B. O.). **Witches' brooms on Southern White Cedars.**—*Journ. New York Bot. Gard.*, xxxv, 411, pp. 41–45, 2 figs., 1934.

A semi-popular account is given of the witches' broom disease of southern white cedar (*Chamaecyparis thyoides*) caused by *Gymnosporangium myricatum* [see preceding abstract], the alternate hosts of which are species of *Myrica*, along the Atlantic coast of the United States from Cape Cod to South Carolina. *G. botryapites* [*R.A.M.*, xi, p. 140] is another common but less destructive parasite of *C. thyoides*, on which it stimulates an excess of wood production resulting in the formation of a spindle-shaped burl at the point of infection. *Amelanchier* [*canadensis* and *A. intermedia*] are the alternate hosts of this species.

UNO (S.). **Studien über Bambusse II. Über die Fäulniss des Bambusses.** [Studies on Bamboos II. On the decay of the Bamboo.]—*Bull. Utsunomiya Agric. Coll., 1934*, 4, pp. 47–56, 1 pl., 1934. [Japanese, with German summary.]

In studies of the fungal decay of cut bamboo canes due to *Poria vaporaria* and *Irpex consors*, the writer found that the inner wall of the cane was more liable to rotting than the outer one, the greater rapidity of decay of the former being apparently correlated with a higher raw protein and starch content. *P. vaporaria* was found to be generally more active than *I. consors* on the bamboo varieties under observation, of which Ma was the least and Taisan the most susceptible to both fungi.

RUMBOLD (CAROLINE T.). **A new species of Graphium causing lumber stain.**—*Phytopath.*, xxiv, 3, pp. 300–301, 1 fig., 1934.

English and Latin diagnoses are given of *Graphium rubrum* n.sp., found in association with *Ceratostomella pilifera*, *C. pluriannulata* [*R.A.M.*, xii, p. 665], and *G. rigidum* [ibid., viii, p. 746] on freshly cut sapwood of poplar (*Populus deltoides*), oaks (*Quercus alba* and *Q. lyrata*), *Liquidambar styraciflua*, and pine in Wisconsin.

The new species is characterized by dark brown to black synnemata, 480 to 2,000 μ (average 780 μ) in height and 9 to 86 μ (45 μ) in breadth, the head composed of hyaline, branched hyphae bearing oblong, hyaline, primary conidia, 4 by 2 μ, united by a carmine-coloured mucus into a globule ranging from 18 to 425 μ (average 200 μ) in diameter. Under unfavourable conditions the conidia form yeast-like budding colonies. The cultures change from hyaline to grey, slate, and slaty-black with maturity. Clavate, hyaline, secondary conidia, 8·5 by 3·2 to 14 by 2 μ (6·5 by 2 μ), develop on the hyphae or at the tips of simple, erect conidiophores in culture. A preliminary description of this fungus was

given by the writer in *Naturw. Zeitschr. für Forst- u. Landw.*, ix, p. 429, 1911.

Inoculation experiments with a pure culture from *L. styraciflua* resulted in a grey to greyish-black stain on this host and in a pale grey discoloration of *Pinus echinata* and *P. taeda*.

HUBERT (E. E.). **The protection of jointed wood products against decay and stain.**—*Univ. of Idaho Bull.*, xxix, 3 (*School of Forestry Bull.* 4), 33 pp., 10 figs., 1934.

A detailed account is given of an investigation started in 1930 at the Idaho School of Forestry for the purpose of finding an effective and economic method of protecting wood joints in structures exposed to weather conditions against decay and disfiguring stains. Broadly outlined, the work (most of which was done on cut off corner joints of *Pinus ponderosa* window sashes, chiefly sapwood but with occasional pieces of heartwood) consisted of preliminary laboratory tests to determine effective means and materials for preventing rotting and staining, followed by tests in a specially constructed cellar to corroborate the results obtained in the laboratory and to try out new compounds, and finally of laboratory tests to determine the efficacy of various paints and water-repellent coatings against the absorption of moisture by the wood and against attack by wood-destroying fungi, as represented in the experiments by *Lenzites trabea* [*R.A.M.*, xi, pp. 84, 684]. The results [which are fully described and discussed] indicated that a satisfactory measure of protection of the wood joints may be obtained by applying a toxic, penetrating chemical compound to a part or to the whole of the joint, or by placing the compound in a shallow cup carved out in the tenon of the joint; or alternatively by treating the joint as above with a water-repellent substance possessing high wood-penetrating qualities. In certain cases these two methods may be usefully combined. Of the many substances tested, the following ten were found to be the most effective, in ascending order of their approximate cost: Protection (a proprietary preparation), Bruce preservative, gasolene-naphthalene-paraffin, zinc bronze paint, zinc chloride-borax, sodium fluoride-borax, linseed oil-white lead paints, zinc priming-paint (two coatings), lignasan [ibid., xiii, p. 341], and treheal.

GILLANDER (H. E.), KING (C. G.), RHODES (E. O.), & ROCHE (J. N.). **The weathering of creosote.**—*Indus. & Engin. Chem.*, xxvi, 2, pp. 175–183, 3 figs., 3 graphs, 1934.

Full technical details are given of the construction and use of a machine to determine within a reasonably limited period the effects of weathering on small pine sapwood blocks evenly impregnated with creosote. The course of weathering was followed by removing a certain number of blocks at stated intervals and noting (1) their resistance to direct attack by fungi (e.g., *Fomes annosus* and *Lentinus lepideus*), (2) the percentage loss of oil, (3) the toxicity of the extracted oil, and (4) the distillation range of the latter. Nine weeks' treatment in the machine is said to correspond to many years' service in the open.

PHILLIPS (M.). **The chemistry of lignin.**—*Chem. Reviews*, xiv, 1, pp. 103–170, 1 fig., 1934.

A comprehensive summary, supplemented by a bibliography of 304 titles, is given of the literature on the more important facts pertaining to the chemistry, metabolism, and microbiological decomposition of lignin [cf. *R.A.M.*, xiii, pp. 196, 279].

GILBERT (W. W.) & POPENOE (C. H.). **Diseases and insects of garden vegetables.**—*U.S. Dept. of Agric. Farmers' Bull.* 1371, 46 pp., 65 figs., 1934.

This is a revision of the bulletin originally issued in 1924 dealing in popular terms with the symptoms, etiology, and control of some well-known diseases and pests of garden vegetables in the United States [*R.A.M.*, iii, p. 495].

BLANK (L. M.). **Uniformity in pathogenicity and cultural behavior among strains of the cabbage-yellows organism.**—*Journ. Agric. Res.*, xlviii, 5, pp. 401–409, 1934.

A detailed account is given, in continuation of the author's studies of cabbage yellows (*Fusarium conglutinans*) [*R.A.M.*, xiii, p. 2], of his investigation of the comparative pathogenicity and behaviour in pure culture of 19 isolates of the organism obtained from eleven of the United States. The result of the cultural tests failed to reveal any significant differences in the rate of growth, colour production, and sporulation of these strains, and also of the hyphal-tip lines derived from certain of them. Sectoring was observed in the hyphal-tip lines of only one strain. The uniformity of the strains was further confirmed by pathogenicity trials on selected lines of cabbage and on other subspecies of *Brassica oleracea* [loc. cit.], all giving one common type of reaction on these hosts. Homozygous susceptible lines of cabbage were uniformly attacked by all the strains except two, which showed a lesser degree of virulence than the rest, while homozygous resistant lines proved to be equally resistant to all the isolates at 24° C. No evidence of specialization in parasitism was observed on the six subspecies of *B. oleracea* that were tested.

These results, taken in conjunction with the fact that in the F_2 progeny of crosses between resistant and susceptible lines of cabbage the proportion of plants which became diseased when tested with nine strains was in all cases close to the expected 25 per cent., is considered to indicate that specialization of *F. conglutinans* is not a vital factor in the problem of selection and breeding for resistance to cabbage yellows.

STAPP (C.). **Prüfungen von Busch- und Stangenbohnen auf Widerstandsfähigkeit gegen den bakteriellen Erreger der Fettfleckenkrankheit.** [Tests of bush and pole Beans for resistance to the bacterial agent of the grease spot disease.]—*Angew. Bot.*, xvi, 2, pp. 207–218, 1 fig., 1934.

Continuing his studies on the varietal reaction of beans [*Phaseolus vulgaris*] to grease spot disease (*Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [*R.A.M.*, xii, p. 742; see also xiii, p. 490], the writer tested 75 bush and 40 pole varieties from this

standpoint. The results of the inoculation experiments [which are discussed and tabulated] showed a general superiority of pole over bush beans in respect of resistance to grease spot, the wax varieties in the latter group being particularly susceptible. Under the conditions of the experiments only three bush varieties gave evidence of resistance, viz.. Holländische Schwertbohne, Allererste Weisse Treibbohne, and Kaiser Wilhelm, while six of the pole type withstood infection, namely, Avantgarde, Zehnwochen, Bahnbrecher, Arabischer weisser Czar, Arabische Zweifarbige, and Arabische Schmetterlingsbohne.

ESAU (KATHERINE). **Cell degeneration in relation to sieve-tube differentiation in curly-top Beets. A preliminary note.**—*Phytopath.*, xxiv, 3, pp. 303–305, 1 fig., 1934.

In the leaves and roots of curly top beets in California visible pathological changes were found to occur only after the differentiation of the primary sieve-tubes, affecting the cells surrounding these [*R.A.M.*, xiii, p. 145]. In the root tips the cells adjacent to the protophloem sieve-tubes develop inclusion bodies and undergo hypertrophic and necrotic modifications. In the later stages of infection degeneration spreads to other phloem cells, causing the formation of a peculiar hyperplastic tissue. In diseased beet roots the phloem of the newly formed, concentric rings of vascular tissue resulting from secondary growth also becomes involved. The sieve-tubes would thus appear to play an important part in the initiation of degenerative changes in curly top beets, perhaps because they act as channels for the translocation of the virus.

GOTO (K.). **Relations between length and width suggesting volume-constancy in the under-cell of teliospores of Onion rust.**—*Ann. Phytopath. Soc. Japan*, iii, 1, pp. 22–36, 4 graphs, 1934.

A method is detailed, based on the calculation of the length to width relations, for the determination of the volume of the lower cell of the teleutospores of the rust (*Puccinia*) [*allii* or *P. porri*: *R.A.M.*, xiii, p. 73] on *Allium* spp. (chiefly *A. fistulosum*, but also on *A. schoenoprasum*, *A. bakeri*, and *A. scorodoprasum*) in Japan. From the resulting data [which are discussed and tabulated] it is apparent that a considerable degree of volume constancy characterizes the organs under observation, though their shape varies conspicuously.

DU PLESSIS (S. J.). **Pink root and bulb-rot of Onions.**—*Farming in South Africa*, ix, 95, p. 70, 1934.

In the author's studies on pink root (*Fusarium cepae* and *Phoma terrestris*) and bulb rot (*F. cepae*) in South Africa, it has been found that these fungi may cause losses amounting to between 20 and 30 per cent., and losses of up to 50 per cent. may occur when they are accompanied by white mould [(?) *Sclerotium cepivorum*: ibid., xii, p. 135; xiii, p. 348]. A number of commercial varieties, viz., Australian Brown, Cape Straw Coloured, Danvers Yellow, Early Flat Yellow Cape, Paris Silver Skinned, Prize Taker, Spanish Brown, and White Queen, were all found to be susceptible.

Garlic, leeks, and shallots are also subject to pink root but not to bulb rot. Plants growing at a temperature of 25° C. were more severely attacked than at 30°, and infection was more prevalent on dry than on moist soils. Moderate nitrogenous manuring exercises a beneficial effect on the course of the disease, while adequate protection may be ensured by 15 minutes' immersion of the seed in 0·1 per cent. mercuric chloride. The most practical and satisfactory method of control on seed-bed soil is to burn straw or shrubs on the ground for 45 minutes, so that the skin of a potato buried 3 in. deep before treatment would readily peel off afterwards. Brief notes are given on the fertilization and irrigation of the onion fields, in which biennial rotation at least should be practised.

WALKER (J. C.) & MURPHY (A.). **Onion-bulb decay caused by Aspergillus alliaceus.**—*Phytopath.*, xxiv, 3, pp. 289–291, 1 fig., 1934.

Aspergillus alliaceus Thom & Church [cf. *R.A.M.*, v, p. 700], a yellow-spored, sclerotium-forming species, has twice been intercepted, in 1919 and 1929, on garlic entering United States ports from Italy. Inoculation experiments on wounded onion bulbs resulted in the production of a brown discoloration, shrinkage, and eventual desiccation of the tissues. At favourable temperatures for the pathogen (28°, 32°, and especially 36° C.) a dense, white mycelial mat is formed between the bulb scales, and white, later black sclerotia develop throughout the rotted tissue. The conidia are produced abundantly on the surface of decaying bulbs at high relative humidity. *A. alliaceus* proved incapable of attacking growing White Portugal onion plants, confining its pathogenicity to the mature bulbs, on which it may be combated by keeping the storage temperature below 20°.

COCHRAN (L. C.). **The host specificity of Septoria petroselini and S. apii-graveolentis.**—*Phytopath.*, xxiv, 3, pp. 309–310, 1934.

In a previous paper [*R.A.M.*, xii, p. 196] the writer showed that the two species of *Septoria* attacking celery, namely, *S. apii* and *S. apii-graveolentis* were unable to attack parsley. Further cross-inoculations with *S. petroselini* from parsley and *S. apii-graveolentis* from celery (both obtained from Baarn) showed that each is specific to its own host. These results are considered to afford further justification for the separation of the parsley and celery species of *Septoria*.

ABDEL-SALAM (M. M.). **Botrytis disease of Lettuce.**—*Journ. Pomol. and Hort. Science*, xii, 1, pp. 15–35, 1 pl., 1934.

A detailed account is given of the author's investigation of the disease of lettuce caused by *Botrytis cinerea* in England, where it is stated to be widely distributed. The results indicated that the most serious phase is the collar rot (locally known as 'red leg' in the Thames Valley) produced in young lettuce seedlings, especially at the time when they are transplanted from the frames to the field in the spring, when as many as 70 per cent. of the seedlings may be killed. This form of the disease does not usually affect

sowings made in the open in late spring or in summer, but throughout the summer slight damage may be caused by lesions on the stems and lower leaves. *B. cinerea* has also been found to attack and kill lettuce plants in the field when they are injured by frost or affected with a trouble known in the Thames Valley as 'greasiness' and similar to the disease described as tipburn in America [*R.A.M.*, vii, p. 422].

Infection with *B. cinerea*, either natural or artificial, was much less in warm greenhouses than in cold frames, and there was a suggestion that high atmospheric humidity is probably more conducive to attack than high soil humidity. The incidence of the disease is increased by abnormally early sowing in the autumn, although seedlings sown at the normal time may also occasionally exhibit a high percentage of attack when planted out in the spring. Overwintered seedlings usually show a higher incidence of the disease when planted out early in the spring than those transplanted later. Of ten varieties tested for relative susceptibility, the cabbage type Lee's Immense was the most resistant, followed by the Cos types Bath's Black-seeded and Hick's Hardy White. It is suggested that resistance is correlated with the development of an infiltrated layer of a gum-like substance which forms in the healthy tissue bordering the lesions. Steeping the overwintered seedlings before planting out in a 0·5 per cent. uspulun or nugreen solution for half to one hour gave promise of value in the control of the 'red leg' form of the disease, but applications of uspulun to the soil of the cold frames during the growth of the seedlings caused considerable permanent stunting of the plants.

Isolations from diseased plants throughout the year yielded 13 strains of *B. cinerea* falling into two groups, one of which is characterized by the profuse development of sclerotia with few conidia, and the other by the development of abundant conidia with few or numerous sclerotia.

SLEETH (B.). **Fusarium niveum, the cause of Watermelon wilt.** —*West Virginia Agric. Exper. Stat. Bull.* 257, 23 pp., 3 figs., 2 graphs, 1934.

The section of this paper dealing with physiologic specialization in *Fusarium niveum*, the agent of watermelon wilt [*R.A.M.*, xiii, p. 5], is partially covered by an earlier abstract [ibid., xi, p. 422]. The optimum temperature for the growth of the fungus in culture was found to lie between 24° and 28° C., the minimum being about 5° and the maximum just above 35° [ibid., vii, p. 422]. Grown on an ammonium-nitrate solution with an initial hydrogen-ion concentration of P_H 4·4, strains 5, 8, 20, and 23 (from Oregon, Iowa, North Carolina, and Texas, respectively) increased the acidity to about P_H 3·8 in 72 hours, followed by a decrease to between P_H 7·5 and 7·8 at the end of 36 days. Dissociants of strains 11 and 16 (from South Carolina and West Virginia, respectively) developed both in culture and on plants growing in soil inoculated with these strains. The apparent collapse of resistance in a given variety to *F. niveum* may be explained on the basis of the appearance by dissociation of new strains of enhanced virulence derived from those of restricted pathogenicity. It is obvious, therefore, that trials of

varietal reaction to watermelon wilt should include a number of virulent physiologic forms.

BEAUMONT (A.) & STANILAND (L. N.). **Tenth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1933.**—39 pp., 1 fig., 2 diags., 1934.

In this report notes are given on fungal diseases observed during the year in the south-west of England on cereals, potatoes, root crops, broad beans [*Vicia faba*], vegetables, fruit, and flowers. Infection by potato blight [*Phytophthora infestans*] was slight, and good results were again given in forecasting outbreaks by the humidity method, the attacks following exactly the temperature and humidity conditions previously reported as conducing to infection [*R.A.M.*, xiii, p. 8]. A day is counted as favourable to blight when there is (1) dew either the night before or in the morning, (2) minimum temperature of 50° F. or above, (3) sunshine of less than 5 hours, (4) rainfall at least 0·01 inch, (5) relative humidity at 3 p.m. not less than 75 per cent. A favourable period early in June was succeeded by warm, dry weather, and no outbreak occurred then. Humidity was high all day on 8th, 11th, 13th, and 17th to 19th July, and blight broke out in many parts of Devonshire between 15th and 20th July, and at Seale-Hayne on 29th. During August, high humidity prevailed all day only on 15th, and the disease made very slow progress. The humidity data clearly account for the exceptionally light infection, there being only 16 days of high humidity in the period May to August, while the average 3 p.m. humidity for May, June, July, and August was only 67·7, 67·4, 67·7, and 62·5 per cent., respectively. Blight first appeared in West Cornwall on 7th May; from 23rd April to 14th May the 3 p.m. humidity was 75 per cent. or over every day at the Lizard and during the first week in May the daily minimum temperature was significantly higher in West Cornwall than at Seale-Hayne, being 50° or 51° F. on six days out of eight in the former locality, whereas in the latter it was 44° and 45° on two days, respectively, 47° on two days, and on no occasion over 49°. Thus, though the humidity was favourable for blight during many days in late April and early May at Seale Hayne, the temperature never reached the requisite point in that locality.

In an experiment for the control of club root [*Plasmodiophora brassicae*: loc. cit.] 1 cwt. ground burnt lime was spread over one-eighth acre of an infected field sown to marrow stem kale [Chou moellier: *Brassica oleracea* var. *acephala*: ibid., xiii, p. 71], Bruce turnip [ibid., xiii, p. 343], and another variety of common turnip on one farm, and 1 cwt. hydrated lime over one-tenth acre on a similarly infected field of Balmoral and King of the West swedes on another farm. The P_H value of the limed plots was, respectively, 7·02 and 6·76 and that of the unlimed 6·35 and 6·14. On the first farm the kale remained healthy in both the treated and untreated soil, but while the turnips in the unlimed soil became badly infected, those in the limed ground were unaffected. On the second farm the disease was prevalent though mild on both varieties of swede in the unlimed plot, but only one diseased root

could be found in the treated soil. The result obtained on both farms is attributed to the effect of the liming in raising the P_H value of the soil above 6·6, this value being regarded as the probable limit for club root.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1931. [Diseases and pests of cultivated plants in the year 1931.]—*Mitt. Biol. Reichsanst. für Land- und Forstw.*, 48, pp. 1–62, 2 graphs, 48 maps, 1934.

This survey of the fungous diseases and insect pests attacking cultivated plants in Germany in 1931 is compiled on the same lines as the previous report [*R.A.M.*, xi, p. 693]. The distribution of the various disorders is represented by maps.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1933.** [Review of phytopathological records noted in 1933.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 1, pp. 1–78, 6 figs., 1934.

This report [cf. *R.A.M.*, xii, p. 743] contains among many others the following items of phytopathological interest. During the past three years a serious wilt of Uva di Troia vines grafted on 3309 has occurred in the vicinity of Barletta, caused probably by environmental conditions assisted by the commonly observed mycosis of the stem and branches which produces rapid withering; this mycosis, considered by Viala and Marsais to be a cause of court-noué [ibid., xiii, p. 422], the author regards only as a secondary symptom, aggravating and accelerating the wilt set up by leaf roll or other diseases. Extensive necrotic areas due to pruning wounds were present in the wood of the stock. Various weak parasites and a sterile mycelium which in some respects resembled that of *Pumilus medullae* [loc. cit.] were isolated from the affected plants. Vines, especially the Barbèra variety, growing at Casale Monferrato showed dark, sunken spots on the berries very similar to bitter pit of apples, while the leaves were also markedly deformed; it is thought that the condition may be due to a virus.

Peaches at Trieste were attacked by *Bacterium pruni* [ibid., xii, p. 268], and strawberries near Pisa developed a root rot of undetermined origin [ibid., xiii, p. 454]. Tomato wilt (*Fusarium lycopersici*) [ibid., xii, p. 732] was reported from numerous localities in Liguria, Lazio, Puglia, and Sicily. In one experimental plot at Taranto the Break o' Day variety was highly resistant. Tomatoes affected by mosaic were received from Eritrea and Bari. Many fields of *Trigonella* at Agrigento were severely attacked by *Sclerotinia trifoliorum* and *S. libertiana* [*S. sclerotiorum*].

CONNERS (I. L.). **Thirteenth Annual Report of the Canadian Plant Disease Survey 1933.**—pp. i–ix, 1–75, 103–128, 1934. [Mimeographed.]

Since the publication of Sanford's note on a new foot rot of oats in Alberta [*R.A.M.*, xiii, p. 224], two organisms have been isolated from diseased material, namely, *Fusarium equiseti* [ibid., ix, p. 667] and an unknown, dark, sclerotial fungus. Work on the pathogenicity of these is in progress.

The British Columbian Lytton strain of lucerne was severely infected at Ottawa and ten other stations between Alberta and Quebec by downy mildew (*Peronospora aestivalis*) [*P. trifoliorum*: ibid., xii, p. 177], which is evidently a disease of serious potentialities.

In Ontario lettuce was heavily damaged by marginal leaf spot (*Pseudomonas marginalis*) [*Bacterium marginale*: ibid., xii, p. 677], and pepper [*Capsicum annuum*] fruits were attacked by *Sclerotium bataticola* [*Macrophomina phaseoli*: ibid., ix, p. 82], both new records for the country. *Pythium ultimum* [ibid., xiii, pp. 5, 394] caused a destructive soft rot of seed potato tubers in British Columbia.

The only new fruit disease reported during the period under review was false blossom of cranberry [see below, p. 589]. Strawberries at Stamford, Ontario, exhibited symptoms noticeably resembling those of 'xanthosis' and 'yellow edge' [ibid., xiii, p. 314].

Notes are given on a number of other diseases of cereals, forage and fibre plants, vegetable and field crops, forest and shade trees, and ornamentals [cf. ibid., xii, p. 551], and a list has been compiled of over 400 specimens of fungi from miscellaneous plants added to the Mycological Herbarium, Division of Botany, Ottawa, during the year.

ADAMS (J. F.). **Report of the Plant Pathologist for 1933.**—*Quart. Bull. State Board of Agric., Delaware*, xxiv, 1, 15 pp., 1 diag., 1934.

In this report, which is on the same lines as those for previous years [*R.A.M.*, xii, p. 612], the author states that during the period under review the spray service in Delaware was conducted in the same manner as that established during the previous seven years. Overwintered apple leaves showing infection by scab [*Venturia inaequalis*] were collected during March; with the approach of the fungus to maturity spore traps were set up for study during the primary infection period of April, May, and June, the information so obtained being essential for timing early spray recommendations. The rainfall and spore discharge data for the season are given; in 1933 there were four periods of major spore discharge, as compared with three in 1932.

In Delaware official spray notes for fruit orchards are issued (through the county agents) according to the prevailing climatic conditions and pest and disease development, in co-operation with the entomologist; during the 1933 growing season eleven editions of these notes were issued.

Notes are given on the diseases of economic crops observed in Delaware during 1933.

MANNS (T. F.) & ADAMS (J. F.). **Department of Plant Pathology.**—*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending 30th June, 1933* (*Bull.* 188), pp. 36–46, 1934.

Studies on the masking of yellows and little peach in other species of *Prunus* indicated that some varieties of plums may act as carriers of these diseases, which can be disseminated from them by the leafhopper *Macropsis trimaculata* [*R.A.M.*, xii, p. 518]:

this insect vector lives principally on the plum and is very sparingly found on peach trees. During the past two years both diseases were transmitted by budding into plum varieties and the Japanese variety Abundance (*P. salicina*) was shown to carry the viruses of both without any marked symptoms, and to be capable of reinfecting the peach by budding. Both viruses were probably introduced into America on Oriental plum varieties.

The evidence obtained in field control experiments and sprayed commercial plantings supported the view that the zinc-lime spray (4–4–50 or 5–5–50) against bacterial spot [*Bacterium pruni*: ibid., xii, p. 145] is beneficial to peach trees apart from the control of the disease. This spray, in combination with lead arsenate, was consistently associated with less arsenical injury on peach foliage than were various sulphur sprays. Post-harvest or spring applications of zinc-lime (8–8–50) reduced the amount of disease present as effectively as summer applications at a concentration of 4–4–50.

The results of field control experiments did not justify the complete substitution of zinc-lime for any of the sulphur sprays for the control of peach brown rot [*Sclerotinia americana*] and scab [*Cladosporium carpophilum*: ibid., xii, pp. 11, 573, 709]; zinc sulphate (2 lb. to 50 galls.), in combination with reduced quantities of certain sulphur sprays, gave practical control of *C. carpophilum* in cases of moderate infection.

Bacterial leaf spot [*Bact. phaseoli* var. *sojense*: ibid., ix, p. 228] was the only disease prevalent on soy-beans in commercial plantings in 1932. Sowings were again made during July from the source of seed reselected for three successive years from resistant plants, and even in the first week in September only 7 plants were diseased in 100 yds. of drill row.

Toxicity tests with commercial summer oil sprays indicated that the use of certain summer oil sprays may entirely offset early season control of plant diseases and accelerate mid-season infection.

In the growing season of 1932 conditions were more favourable for apple scab [*Venturia inaequalis*] than they were in 1931. In the latter year 90 per cent. of the spores were mature by 27th March, but in 1932 this stage of maturity was not reached until 22nd April. In both years, however, the initial spore discharge occurred on 26th April [cf. preceding abstract].

Summary of research, 1887–1933. Forty-fifth Annual Report. —*Arkansas Agric. Exper. Stat. Bull.* 297, 126 pp., 3 figs., 1934.

This report contains scattered references of phytopathological interest, the more recent of which have already been noticed in this *Review* from other sources.

CURZI (M.). **De fungis et morbis africanis. II. De Pseudomonas plantarum parasitis Somaliae.** [Of African fungi and diseases. II. Concerning *Pseudomonas* parasitic on plants in Italian Somaliland.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 1, pp. 173–184, 2 pl., 1934. [Italian, with English summary.]

Notes are given on the following bacterial diseases of plants recently observed in Italian Somaliland [cf. *R.A.M.*, xii, p. 246],

viz. *Pseudomonas* [*Bacterium*] *malvacearum* on cotton, *P.* [*Bact.*] *phaseoli* on *Dolichos*, *P. ricinicola* [*Bact. ricini*] on castor (*Ricinus communis*), *P.* [*Bact.*] *sesami* on sesame, *P.* [*Bact.*] *solanacearum* on groundnut, castor, and Cavendish banana (*Musa chinensis*) [*M. cavendishii*], and *P.* [*Bact.*] *tumefaciens* on cassava.

The record of *Bact. ricini* on castor is stated to be the first outside Japanese territory [cf. ibid., viii, p. 221; xii, p. 554]. In Italian Somaliland it is very prevalent during wet weather, producing on the leaves polyhedric spots 1 to 4·5 (mostly 2 to 2·5) mm. wide, covered with bacterial exudate. The mesophyll of the affected parts is greatly changed, the epidermis is usually detached, and between the latter and the palisade numerous bacteria are present. Originally named *Bact. ricini* the organism was renamed *Bact. ricinicola* by Elliott to avoid confusion with *Phytomonas ricini*. The author adopts Elliott's specific name but transfers the species to *Pseudomonas* as *P. ricinicola* n. comb. In agreement with the Japanese workers *Phytomonas ricini* is considered only a synonym of *Pseudomonas* [*Bact.*] *solanacearum*.

The sesame bacteriosis caused by *Bact. sesami* is both vascular and parenchymatous and has many points in common with the disease produced on various hosts by *Bact. solanacearum*; it is perhaps identical with the sesame disease attributed to the latter organism by Kornauth and Smith in 1903 and by Honing in 1913. Smith considered both diseases to be identical and due to *Bact. solanacearum*, which, however, Nakata [ibid., ix, p. 577] and Kovačevski [ibid., ix, p. 698] have shown to be distinct from *Bact. sesami*.

The groundnut bacteriosis caused by *Bact. solanacearum* [ibid., xi, pp. 123, 621] is one of the most serious affections of this host in Italian Somaliland. Plants severely attacked show dark spots at the base of the branch system and stem, the epidermis being ruptured and a dark bacterial exudate present. On castor *Bact. solanacearum* causes a wilt of well-developed as well as small plants. Banana wilt due to the same organism [ibid., ix, p. 89] was frequently observed, especially in abandoned or neglected plantations; the affected plants appear as if suffering from drought, the leaves almost ceasing growth, turning yellow, wilting, and drooping over the base of the stalks. Occasionally, the plants show no serious outward symptom, but in such cases the vessels are discoloured and contain bacteria.

WHITAKER (T. W.). **The occurrence of tumors on certain Nicotiana hybrids.**—*Journ. Arnold Arboretum*, xv, 2, pp. 144–153, 1 pl., 1 fig., 1934.

The spontaneous tumours, closely resembling those due to crown gall [*Bacterium tumefaciens*], occurring first on the roots and later on the stems of F_1 species hybrids between *Nicotiana glauca* and *N. langsdorffii* and apparently first described by Kostoff [*R.A.M.*, ix, p. 797; xiii, p. 498], appear from all the available evidence to result directly from internal disturbance associated with the introduction of the chromosome complement (haploid 9) of *N. langsdorffii* (pollen parent) into the cytoplasm of *N. glauca* (seed parent), the haploid chromosome number of which is 12, while that of the

hybrid (root tip) is 21. Tumours only resulted when *N. glauca* was the female parent.

NEILL (J. C.). **Field trials with 'ceresan new' seed dust.**—*New Zealand Journ. of Agric.*, xlviii, 5, pp. 269–271, 1934.

In 1933–4, eighty-one trials of 'ceresan new' dust were carried out on field crops of oats, barley, wheat, and peas in New Zealand [*R.A.M.*, xiii, p. 501], the method adopted being to record only visible outstanding differences between it and other seed treatments in use on the farms. The results showed that cereal seed dusted with ceresan new frequently germinated better than seed left untreated or treated by other methods. The control of oat smuts [*Ustilago avenae* and *U. kolleri*] was at least as effective as that given by formalin, mercuric chloride, or Clarke's protector. No effect on peas was observed.

BRODSKY (J.). **Der Einfluss der kohlensauren Kupferbeizen für Getreide auf den Tierorganismus.** [The influence of copper carbonate disinfectants on the animal organism.]—*Arch. für. Gewerbepath. und Gewerbehyg.*, v, 1, pp. 91–107, 5 figs., 1933.

Full clinical details are given of pulmonary and digestive disturbances induced in workmen on a Russian State farm by the inhalation of a seed-grain disinfectant consisting of copper carbonate with a small admixture of copper sulphate and traces of arsenic [cf. *R.A.M.*, vi, pp. 277, 475; vii, p. 624]. The apparatus used for treating the seed-grain (Neuhaus [ibid., v, p. 157] and Niloff 2 [ibid., xii, p. 617]) were defective in the fitting of the individual parts, with the result that the dust escaped in a cloud. For the protection of the workmen special seed disinfection rooms with adequate ventilation, hermetically sealing machines, and dust-proof transport sacks are advocated.

TU (C.). **Physiologic forms of Puccinia graminis tritici in Kwangtung, Southern China.**—*Phytopath.*, xxiv, 4, pp. 423–424, 1934.

Six physiologic forms of *Puccinia graminis tritici* have been found by inoculation experiments on Stakman's and Levine's twelve differential wheat varieties [*R.A.M.*, ii, p. 158] to exist in Kwangtung Province, Southern China. Two of the forms correspond with 15 and 9, respectively, as described by the above-mentioned writers, while the remaining four appear to be new, and in Stakman's and Levine's latest key (mimeographed) are designated 132–5, inclusive.

GASSNER (G.) & FRANKE (W.). **Der Stickstoffhaushalt junger Weizenpflanzen in seiner Abhängigkeit von der Mineralsalzernährung. Ein Beitrag zum Problem der Rostresistenz.** [The nitrogen economy of young Wheat plants in relation to mineral salt nutrition. A contribution to the rust resistance problem.]—*Phytopath. Zeitschr.*, vii, 2, pp. 187–222, 1 diag., 8 graphs, 1934.

It was impossible to ascertain by chemical analysis the parts played, respectively, by alterations in the protein content and in

the soluble nitrogen compounds, respectively, in wheat (two Squareheads and Malakoff) receiving different proportions of a complete fertilizer in regard to the reaction of the leaves to form XIV of *Puccinia triticina* [*R.A.M.*, xi, p. 98; xii, p. 274; xiii, p. 429]. The quantity of nitrogen was further found to afford no clue to varietal reaction to brown rust, which appears to depend rather on quantitative variations within the albumin groups. It is assumed that a given rust form is capable of assimilating only certain definite and specific 'albumin units', the percentage of which in the proteins of any one variety is constant and unaffected by external factors. It is obvious, therefore, that the greatest effect on rust resistance of alterations in albumin economy as a result of variations in the fertilizing scheme should be found (as the authors have, in practice, found) among semi-resistant wheats, the immune and highly resistant strains having too little, and the very susceptible types too much of this specific substance to be materially affected by alterations in the total proteins caused by fertilizers.

BECKER (HANNA). **Zur Immunitätszüchtung des Weizens gegen Puccinia glumarum und Puccinia triticina.** [On the breeding of Wheat for immunity from *Puccinia glumarum* and *Puccinia triticina*.]—*Kühn-Arch.*, xxxviii, pp. 293–305, 1933.

A tabulated summary is given of the methods and results of experiments at the Halle Agricultural Institute in the breeding of wheat for freedom from yellow and brown rusts (*Puccinia glumarum* and *P. triticina*). Much of the work referred to has already been noticed in this *Review*. On the basis of recent studies by the writer five additional physiologic forms of *P. glumarum* are distinguished (15 to 19). For breeding purposes the five forms used at Halle are 1, 4, 7, 8 [*R.A.M.*, xiii, p. 429], and 18 (from Danzig), the last-named being identical with that from Neukirch [ibid., ix, p. 514]. None of the winter wheats except Chinese 165 and 166 gave any evidence of resistance to these forms, whereas among the summer varieties five were resistant to all the forms except 1. Systematic hybridization experiments showed that the inheritance of resistance is not consistently recessive or dominant nor governed by a certain number of factors, but varies with the original parent species and with the partner in the cross [ibid., xiii, p. 318]. Resistance in the summer wheats is recessive, due to a single factor, and in Chinese 166 it is dominant, due apparently to two factors. Selection for resistance among the summer wheat hybrids should be made in the F_2 generation, at which stage consistently resistant types have already developed, whereas in the Chinese crosses the work is best postponed until subsequent generations when the homozygotic, dominant types have accumulated.

SUTHERLAND (J. L.) & JODON (N. E.). **Resistance of Wheat varieties to bunt at Moccasin, Montana, and North Platte, Nebraska.**—*Journ. Amer. Soc. Agron.*, xxvi, 4, pp. 296–306, 1934.

A tabulated account is given of trials of the reaction to bunt

(*Tilletia levis* and *T. tritici*) [*T. foetens* and *T. caries*] of a number of wheat varieties, the work having been in progress for four years at North Platte, Nebraska, and for six at Moccasin, Montana. A considerable number of varieties and strains gave promise of high resistance to the disease, 26 out of the 42 grown at both stations as well as 7 others at Moccasin and 34 at North Platte being superior in this respect to Nebraska No. 60. Minturki, a resistant variety grown commercially in the Great Plains, was surpassed in resistance by ten varieties at Moccasin and twelve at North Platte. At the latter station, Albit and Turkey selection (C. I. 10016) were the only varieties entirely free from bunt while at Moccasin none was completely immune. Deserving of special mention among the newer varieties are Ridit [*R.A.M.*, xiii, p. 86], Cooperatorka [ibid., xii, p. 559], Oro, Turkey selection (C. I. 10015 and 10016), Yogo, and Rio, while earlier information as to the high resistance of Hussar, Martin, and Sherman was confirmed [ibid., xii, p. 429; xiii, p. 20]. The data obtained in these experiments are stated to afford little or no evidence of the occurrence of different forms of bunt at the two stations or of any appreciable variations in the results from year to year.

NATTRASS (R. M.). **Diseases of cereals. II. The flag or leaf smut of Wheat.**—*Cyprus Agric. Journ.*, xxix, 1, pp. 9–13, 2 figs., 1934.

Flag smut of wheat (*Urocystis tritici*), first recorded in Cyprus in 1931 [*R.A.M.*, xi, p. 695], though probably present for many years previously, is now widely distributed throughout the island, where none of the local varieties appears to be resistant. Two resistant Australian varieties, Nalawa and Geeralying, are being propagated at the central experimental farm and it is hoped that seed will eventually be available for distribution. A popular account of the symptoms and control of the disease is given.

FOËX (E.) & ROSELLA (E.). **Etude sur les pietins des céréales.** [A study on the foot rots of cereals.]—*Comptes rendus Acad. d'Agric. de France*, xx, 13, pp. 480–483, 1934.

In this paper (to which a foreword (pp. 479–480) is contributed by E. ROUX), the writers enumerate the Gramineae contracting infection as a result of inoculation with *Cercosporella herpotrichoides*, *Ophiobolus graminis*, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, and *Wojnowicia graminis*, the agents of cereal foot rots in France [*R.A.M.*, xii, p. 685].

C. herpotrichoides attacked all the wheats (representing the bulk of the cultivated species) used in the trials, two-, four-, and six-rowed barley, oats (*Avena sativa*, *A. orientalis semi-nuda*, and *A. nuda*), and Broekema rye, the oats and rye being very slightly affected.

O. graminis also infected all the species of wheat, barley, rye, and oats included in the tests, the last-named again suffering very slightly. A similar observation with regard to the resistance of oats to *O. graminis* was made in April, 1933, near Camp Marchand, Morocco, where this crop remained practically immune in the midst of devastated fields. Infection by *O. graminis* was further

secured on *Aegilops* spp., *Lolium perenne*, *Phleum pratense*, and *Festuca pratensis*, while mild symptoms were also observed on *Avena elatior* [*Arrhenatherum elatius*], *L. italicum*, and *Dactylis glomerata*. In supplementary greenhouse tests with *O. graminis* a very early Caucasian variety of *Setaria germanica* [*S. italica*] developed lodging and *Panicum italicum* a few lesions on the roots. The fungus was found to occur as a saprophyte on old sorghum sheaths, which may possibly serve to perpetuate it through the winter.

W. graminis caused very slight infection of wheat (*T. sativum* and *T. polonicum*) sheaths, while *L. herpotrichoides* and *O. herpotrichus* failed to attack any of the experimental plants, possibly owing to a diminution of virulence since their collection in 1928.

BOCKMANN (H.). **Fusskrankheiten—eine Folge verstärkten Weizenanbaues.** [Foot rots—a sequel to intensified Wheat cultivation.]—*Mitt. für die Landw.* (formerly *Mitt. Deutsch. Landw.- Gesellsch.*), xlix, 17, pp. 365–366, 1934.

The cultural and environmental factors governing the occurrence of blackleg (chiefly *Ophiobolus graminis*) and lodging (primarily *Cercosporella herpotrichoides* and *Fusarium culmorum*), collectively known as foot rot, on wheat in Germany are summarized [*R.A.M.*, xiii, p. 432].

In the Kiel district *C. herpotrichoides* has been observed to form conidia regularly on the diseased stubble and dead leaves on the surface of the ground during the winter. It was experimentally ascertained that in wet weather these spores can germinate on young wheat plants at a temperature of 0° C. and infection can take place up to 15°.

SHANDS (H. L.). **Temperature studies on stripe of Barley.**—*Phytopath.*, xxiv, 4, pp. 364–383, 1 fig., 1 graph, 1934.

The optimum temperature for the mycelial growth of five strains of *Helminthosporium gramineum* (four from the United States and one from Russia) on potato-dextrose agar was found to be near 25° C., with a maximum above 32° and a minimum below 8°.

Floral inoculations were made by spraying a conidial suspension of the fungus on barley flowers that had been enclosed in glassine bags about the time of the emergence of the head from the uppermost leaf sheath, while the seed was infected (*a*) by placing it between layers of medium on which the fungus was growing, and (*b*) incubating seed after contact with the mycelium growing on steam-sterilized wheat kernels [cf. *R.A.M.*, xii, p. 162].

Several types of stripe reaction developed under the influence of different inoculation methods, different cultures of the fungus, and different host varieties at constant air and soil temperatures. Generally speaking, the highest incidence of stripe took place at the lower temperatures (12° to 16°), but under these conditions the symptoms required longer for their development than at higher temperatures (20° to 24°). Change of temperature from low to high or vice versa in the early stages of growth of barley and stripe infection noticeably affected the development both of the plants and of the disease when the seed was inoculated with

mycelium, the change from low to high stimulating the appearance of the symptoms while the converse retarded it. In incubation tests of four days at various temperatures followed by transference to 16°, the highest percentage of infection (71·5) occurred at 20°. In another experiment, at the lower temperatures the inoculated seedlings required longer to reach the same stage of development as those at higher temperatures (15 days at 8° and 4 at 28°) and after transference to the greenhouse at 16° the highest disease percentage (average 88·8) developed in those incubated at the lowest temperature [cf. ibid., viii, pp. 372, 530].

NEILL (J. C.). **Experiments on control of some cereal diseases by seed-dusting. I. The control of Oat-smut. II. The control of Barley diseases.**—*New Zealand Journ. of Agric.*, xlviii, 4, pp. 234–237, 1934.

The tabulated results of experiments made at the Plant Research Station, Palmerston North, showed that dusting oats seed-grain (36 pure lines of which, belonging to seven different varieties, were tested) with copper carbonate or copper oxychloride was not effective in preventing the development of oat smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*) in the subsequent crop. Ceresan and ceresan new dusts gave almost perfect control and slightly increased the number of established plants, and agrosan G. gave even better stands but was not quite as effective in the control of the smuts.

In another series of tests, it was shown that loose smut of barley [*U. nuda*] was completely controlled only by the hot water treatment of the seed-grain, although all the dusts tested somewhat reduced the disease in the ensuing crops. Complete control of covered smut [*U. hordei*], and nearly complete control of stripe [*Helminthosporium gramineum*] were afforded by the organic mercury dusts ceresan, ceresan new, and agrosan G., while copper carbonate and copper oxychloride only reduced the incidence of these diseases.

STANTON (T. R.), COFFMAN (F. A.), & TAPKE (V. F.). **Field studies on resistance of hybrid selections of Oats to covered and loose smuts.**—*U.S. Dept. of Agric. Tech. Bull.* 422, 10 pp., 1934.

After pointing out that in the United States the annual loss from oat smut (*Ustilago levis* [*U. kolleri*] and *U. avenae*) [*R.A.M.*, xiii, p. 434] amounts to approximately 45,000,000 bushels, the authors state that when crosses between the almost immune Markton oat and leading commercial varieties were grown from artificially contaminated seed, the susceptible hybrids being weeded out in each successive generation, smutted plants still occurred in some of the F_5 generation. Several promising hybrids, however, were obtained from crosses combining the resistance of the Markton variety with the desirable characters of the susceptible parent. When two hundred selections isolated from C.I. 357, from which Markton originated, were tested over a period of two years for resistance to covered smut [*U. kolleri*] 156 lines became infected and only a few showed a resistance approximately equal to Markton; there was also considerable morphological variation

showing that C.I. 357 is a mixture of strains. The highly resistant strains isolated from the mixture were similar to Markton in plant and kernel characters, the preponderance of selections of this type indicating that Markton probably represents the dominant morphological form of the original mass strain.

STOREY (H. H.). **Studies on the mechanism of the transmission of plant viruses by insects.**—*Arch. für Exper. Zellforsch.*, xv, 2–4, pp. 457–458, 1934.

This is a condensed version of the writer's account of his studies on the mechanism of the transmission of the maize streak virus by the leaf-hoppers *Cicadulina mbila* and *C. zeae*, which has already been noticed from another source [*R.A.M.*, xii, p. 686].

STEVENS (N. E.). **United States of America: bacterial wilt of Maize.**—*Internat. Bull. of Plant Protect.*, viii, 4, pp. 74–77, 1934.

Bacterial wilt of maize (*Aplanobacter stewarti*) [*R.A.M.*, xiii, p. 390] was again very severe on the sweet varieties in the United States in 1933, when its range was extended to Maine and New Hampshire in the extreme north-east. The severity of the disease also seems to be on the increase in field maize, losses ranging from 2 to 8 per cent. having been recorded in various States, but in certain important sweet corn-growing districts the average reductions of yield were lower in 1933 than in the previous year, partly at any rate owing to the replacement of the most susceptible varieties by more resistant strains and hybrids. Among the susceptible sweet corn varieties losses up to 100 per cent. were reported from Maine, Connecticut, and Pennsylvania, the average for the last-named State, however, being only 30 per cent. in 1933 compared with 45 in 1932.

SĂVULESCU (T.) & RAYSS (T.). **Putrezirea uscată a stiuleţilor de Porumb în România.** [Dry rot of Maize cobs in Rumania.]—*Ann. Inst. Recherches Agron. de Roumanie*, v, pp. 3–112, 34 figs., 6 graphs, 2 maps, 1933. [French summary. Received July, 1934.]

In a brief introduction to this paper the authors give an enumeration of the more important diseases of maize, among which the following are stated to have been recorded in Rumania: smut (*Ustilago zeae*), various rots caused by species of *Fusarium*, and more especially a root and foot rot caused by *F. culmorum* which was troublesome in 1933 in the valley of the Danube and in Dobrogea; rust (*Puccinia maydis*) which is not of economic importance; leaf spot caused by *Bacterium holci* [*R.A.M.*, xii, p. 165], which was also recorded on Sudan sorghum (*Sorghum exiguum*); yellow leaf spots caused by *Helminthosporium* spp.; and *Rhizoctonia bataticola* [*Macrophomina phaseoli*] on the roots and stem bases of maize [ibid., xi, p. 711].

The bulk of the paper is given to a full account of the authors' morphological, biological, cultural, and pathological studies of the dry rot of maize cobs due to *Nigrospora oryzae* [much of which has already been noticed from previous communications: ibid., xii

p. 20]. The disease, which in 1929 was restricted to the valley of the Danube, has since spread over the whole region where Dent maize is cultivated. Comparative tests of varieties and pure lines of maize have shown considerable variations in susceptibility, ranging from high susceptibility in the Dinte de cal de Petroşani variety to high resistance in Cincantin. Varietal resistance has been found to depend on the following factors: an hereditary, apparently dominant, factor for resistance; the time of maturity of the variety, susceptibility increasing with lateness; the water content of the maize grains and especially of the rachis; and the degree of acidity of the cobs at the moment of infection. These factors appear to be governed to a large extent by environmental conditions, and are believed to be modifiable by appropriate cultural methods.

The control measures advocated include sowing resistant pure lines and varieties; the removal and destruction by fire of infected cobs; the use of grain from clean crops; and the disuse of stable manure from cattle fed with diseased maize. Mention is made of experiments in America which are said to have shown that the disease is amenable to control by seed disinfection with organic mercury compounds, which have given increases in yield ranging from 10 to 20 per cent.

KOEHLER (B.), DUNGAN (G. H.), & BURLISON (W. L.). **Maturity of seed Corn in relation to yielding ability and disease infection.**—*Journ. Amer. Soc. Agron.*, xxvi, 4, pp. 262–274, 3 graphs, 1934.

Seed maize of the Reid Yellow Dent variety was selected and harvested at different stages of maturity ranging from about 20 days after fertilization (milk stage) until six weeks after maturity for a period of seven years at the Illinois Agricultural Experiment Station. Seed infections with *Fusarium moniliforme* [*Gibberella moniliformis*] and *Diplodia zeae* increased progressively up to maturity. *Cephalosporium acremonium* [*R.A.M.*, xiii, p. 160] was entirely absent from the first two groups selected, but appeared in those harvested later. Susceptibility to scutellum rot [ibid., x, p. 180] was highest (71·2 per cent.) in the milk stage, after which there was a progressive decline. Seed inoculation at planting time with five organisms capable of causing seedling diseases, viz., *Penicillium oxalicum* [loc. cit.], *G. saubinetii*, *Aspergillus niger*, *A. flavus*, and *P. notatum* [ibid., xiii, p. 459], produced the greatest damage in the immature stages. Ear rots (chiefly *D. zeae* and *G. moniliformis*) were apparently most severe in some seasons in plants raised from immature seed [cf. ibid., xiii, p. 218].

MAINS (E. B.). **Host specialization of Puccinia sorghi.**—*Phytopath.*, xxiv, 4, pp. 405–411, 1934.

In a series of monosporidial cultures of *Puccinia sorghi* [*P. maydis*] on *Oxalis corniculata* made by exposing the plants to maize leaves bearing germinating teleutospores in a manner similar to that adopted by Craigie [*R.A.M.*, viii, p. 296], transference of a mixed pycnidial exudate resulted in 260 out of 290 monosporidial infections producing aecidia, while of the 342 in the untreated

series, only 29 formed these organs. Aecidia were produced even if the transfer of pycnospores was delayed, the thalli still being in a favourable condition for diploidization 34 days after infection. These results, agreeing with those of Cummins [ibid., x, p. 784], indicate that *P. maydis* is self-sterile.

O. corniculata was found to be the most favourable of the various plants tested for the production of the aecidial stage of *P. maydis*, *O. stricta* [ibid., xii, p. 388] and *O. cernua* only very occasionally giving a positive result. *O. europaea* reacted to two collections of the rust (from Indiana and Iowa, respectively), by abundant aecidial production but showed marked resistance to the remaining six and on the basis of its behaviour on this host, therefore, *P. maydis* may be divided into at least two races. The relationship of the physiologic forms of *P. maydis* distinguished by Mains in experiments on maize [ibid., xi, p. 170] to the races differentiated on *O. europaea* has not been fully investigated, but collection 2, to which this plant was susceptible, was found to correspond to form 3. Florida teosinte (*Euchlaena mexicana*) and maize were successfully inoculated with the aecidia of *P. maydis* from *O. corniculata*; negative results were given by tests with this inoculum, and also by uredospores collected on maize, on *Andropogon* spp. and various other grasses, whence it is concluded that the *A. furcatus*—*O. corniculata* rust described by Long (*Phytopath.*, ii, p. 164, 1912) belongs to *P. andropogonis* rather than to *P. maydis*.

JOHNSTON (J. C.). **Experiments in mottle leaf control.**—*California Citrograph*, xix, 6, pp. 148, 159, 1934.

The 1932–3 season was particularly unfavourable for soil treatments against mottle leaf of citrus [*R.A.M.*, xiii, p. 504] in Tulare county, California, where the ring method of applying the materials to the soil in a narrow band round the base of the trunk has been found deleterious and has been discontinued. More injury resulted from zinc sulphate applications in sandy than in heavy soils, the chief drawback to the treatment being its unreliability and the results demonstrating that the safer the method the more uncertain was the control. The best results were obtained by using zinc sulphate in various spray combinations; individual leaf treatments with 5 lb. zinc sulphate in 100 galls. water and with 8 or 10 lb. of the same in 100 galls. of 2 or 4 per cent. lime-sulphur reduced the average amount of mottle leaf from 64·5 to 12·8 and from 44·5 to 2·5 per cent., respectively. Valencia oranges thus treated suffered no injury under conditions where zinc sulphate alone caused severe damage. With 10 lb. zinc sulphate plus 5 lb. hydrated lime in 100 galls. water no injury resulted, but the control obtained was poor, the corresponding reduction being only from 61·4 to 32·8 per cent. There was some evidence that spraying was more effective in autumn or spring than in summer.

NARASIMHAN (M. J.). **Oil Bordeaux mixture against koleroga of Arecanut.**—*Mysore Agric. Calendar 1934*, pp. 21, 25, 1934.

Areca [*Areca catechu*] palms in Mysore sprayed experimentally with Bordeaux mixture to which cheap local vegetable oils were

added as spreaders remained almost free from koleroga [*Phytophthora arecae*: *R.A.M.*, xiii, p. 77] though others in the same garden sprayed with casein Bordeaux mixture became affected. The mixture was made by adding ½ gall. gingelly [*Sesamum indicum*], groundnut, or safflower [*Carthamus tinctorius*] oil to 12½ galls. copper sulphate and slowly pouring the fluid (with the oil floating on the surface) into an equal volume of milk of lime, stirring vigorously.

Vegetable oils as spreaders for Bordeaux mixture.—*Mysore Coffee Exper. Stat. Circ.* 2, 3 pp., 1934.

When coffee in Mysore was sprayed with Bordeaux mixture to which cheap, locally obtainable, vegetable oils made from *Sesamum indicum*, groundnut, and *Pongamia glabra* were added as spreaders at the rate of 0·5 or 1 per cent. [see preceding abstract] the protection afforded against leaf disease [*Hemileia vastatrix*] compared favourably with that given by Bordeaux mixture plus resin-soda, casein, linseed oil, or alum, or by fish-oil-soap Burgundy mixture. On one estate, coffee sprayed with the cheap, vegetable-oil Bordeaux mixtures was only little affected by black rot [*Corticium koleroga*: *R.A.M.*, xii, pp. 435, 436] whereas the unsprayed controls were virulently attacked.

[This paper also appears in *Planters' Chronicle*, xxix, 11, pp. 265–266, 1934.]

Reynolds (E. B.) & Rea (H. E.). **Effect of fertilizers on the yield of Cotton and on the control of the root-rot disease of Cotton on the Blackland Prairie soils of Texas.**—*Journ. Amer. Soc. Agron.*, xxvi, 4, pp. 313–318, 1934.

Eighty-five co-operative fertilizer experiments on cotton [the results of which are tabulated] were conducted with farmers on the Blackland Prairie soils of Texas from 1930 to 1932 to determine the effect of the various treatments on yield and the incidence of root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, p. 231]. Such increases of yield as were obtained were not of a profitable order, while none of the treatments produced any effect on root rot.

Toumanoff (C.). **Action des champignons entomophytes sur la pyrale du Maïs (Pyrausta nubilalis Hün).** [Action of entomogenous fungi on the European Corn borer (*Pyrausta nubilalis* Hün).]—*Ann. de Parasitol. Humaine et Comp.*, xi, 2, pp. 129–143, 3 pl., 1933.

An account is given of the author's studies of the mode of infection of the larvae of the European corn borer (*Pyrausta nubilalis*) with *Aspergillus flavus*, *Beauveria bassiana*, *B. globulifera*, and *Isaria farinosa* [cf. *R.A.M.*, xi, p. 180], the results of which showed that all these fungi readily infect the insects through their body integuments [see next abstract] and invade all the organs. Infection occurs somewhat more rapidly at atmospheric humidities near saturation point than between 46 and 70 per cent. High atmospheric humidities also favour the abundant production on the surface of the larvae of mycelium and conidia, and therefore the rapid transmission of the disease in nature. Temperature, on

the other hand, does not play any part in infection between 17° and 30° C., but temperatures between 8° and 12° appeared to delay infection in a certain measure. Rapid and prolonged cooling of the larvae after inoculation did not stimulate infection. Tests with *B. globulifera* and *B. bassiana* showed that the conidia were killed by exposure to direct sunlight for 2 and 3 hours, respectively, but the conidia of all the fungi were shown to preserve their viability in pure culture for a very considerable length of time.

LEFEBVRE (C. L.). **Penetration and development of the fungus, Beauveria bassiana, in the tissues of the Corn borer.**—*Ann. of Botany*, xlviii, 190, pp. 441–452, 1 pl., 2 figs., 1934.

A brief account is given of artificial inoculations of the European corn borer [*Pyrausta nubilalis*] with *Beauveria bassiana* [*R.A.M.*, xi, p. 299 and preceding abstract], by allowing them to crawl over a culture of the fungus and also by injecting them with a suspension of the spores. The examination of infected larvae showed that germinating spores on their surface produced infection hyphae which penetrated directly the thick sclerotized epidermal layer of the larvae at any point of the body, except the head, the same also applying to the thinner portions of the chitinous covering of the pupae. The study of larvae imported from Manchuria [loc. cit.] indicated that they had already been infected with the fungus in their original home, and gave definite indications that infection may also take place by way of the alimentary canal. After infection by either channel, the fungus first invaded the fat bodies, and then the glandular structures and ganglia, while the muscular tissue appeared to be the most resistant to invasion.

These results are considered to indicate that under favourable conditions *B. bassiana* can be a virulent parasite of the European corn borer. Owing to their initial infection with the fungus, Manchurian larvae do not seem to offer a suitable material for the introduction of insect parasites of the pest into the United States.

MASERA (E.). **Un fungo del genere Botrytis parassita degli insetti.** [A fungus of the genus *Botrytis* parasitic on insects.] —*Riv. di Biol.*, xvi, 2, pp. 266–272, 5 figs., 1934.

A species of *Botrytis*, characterized by septate hyphae and conidia, about 3 μ in diameter, borne on phialides, was isolated in 1931 and 1933 from dead silkworms (*Bombyx mori*) at the Padua Experiment Station. On potato at 25° C. a wine-coloured halo develops round the colony; profuse growth is made on agar and sericine-agar, on which the colour of the mycelium changes from white to yellowish on sporulation. Gelatine is rapidly liquefied. The fungus was found to be pathogenic to *Tenebrio molitor*.

FISH (F. F.). **A fungus disease in fishes in the Gulf of Maine**—*Parasitology*, xxvi, 1, pp. 1–16, 2 pl., 2 figs., 1934.

A fungous disease of epidemic proportions was found in the common sea herring (*Clupea harengus*) throughout the Gulf of Maine in 1931, the common winter flounder (*Pseudopleuronectes americanus*) and the alewife (*Pomobolus pseudoharengus*) being also involved but to a much lesser extent. The causal organism

was found to belong to the genus *Ichthyosporidium*, created by Caullery and Mesnil (*Arch. Zool. Expér.*, iv, p. 101, 1905), for two fish parasites, the specific name being tentatively accepted as *hoferi* Plehn and Mulsow (*Centralbl. für Bakt.*, Ab. 1, lix, p. 63, 1911); the genus *Ichthyophomus* established by the latter workers must be rejected, however, in favour of *Ichthyosporidium* on grounds of priority. The fungus is believed to be a normal parasite of the herring which occurs in an epidemic form only under the influence of certain unknown factors. It was found in herrings preserved in 1926, between which year and 1931 the disease appears to have increased steadily in intensity and subsequently declined.

The stage in which the parasite is most commonly encountered in the host is the so-called 'resting stage', represented by spherical, heavy-walled cells, 5 to 164·5 μ in diameter, containing nuclei averaging 2·2 to 2·5 μ but occasionally reaching 4 to 4·4 μ in diameter; in a single cell 125 μ in diameter there may be several hundred nuclei. The coenocytic, sparsely branched hyphae extending around these cells may attain a length of 20 or 25 times the diameter of the original spherical organism. The mycelium readily penetrates the surrounding tissue and eventually disintegrates into a large number of daughter cells, as described by Daniel (*Amer. Journ. of Hygiene*, xvii, p. 262, 1933).

The macroscopic and microscopic aspects of the lesions caused by *I. hoferi* are fully described. The herring is the only host known to show external signs of infection in the shape of the so-called 'black' or 'pepper' spots which in reality are merely holes in the bright, 'silvery' layer of the intact epidermis due to perforation by a subepidermal pus sac of necrotic tissue. Parasitic cysts, composed of fungus cells surrounded by epithelioid and connective tissue, occur throughout the internal organs both in the herring and the flounder, whereas in the alewife invasion seems to be restricted to the heart. The herring is believed to acquire infection by the ingestion of parasites liberated from fish in the same school, the flounder by the consumption of diseased herring, and the alewife by ingestion of the parasite during its occasional association with the herring. The fungus is thought to enter the host by way of the alimentary canal and thence to spread through the body in the blood stream or through the lymphatic system. It was grown successfully but very slowly at 20° C. on Henrici's routine medium alone or enriched with fish broth, Sabouraud's medium, and fish glycerine agar.

BAKST (H. J.), HAZARD (J. B.), & FOLEY (J. A.). **Pulmonary moniliasis.**—*Journ. Amer. Med. Assoc.*, cii, 15, pp. 1208–1213, 3 figs., 1934.

A species of *Monilia*, characterized by single cells 4 to 12 μ in diameter, hyphae 1·5 to 2 μ in thickness, and oval conidia with a maximum diameter of 2 to 5 μ, was isolated from the sputa of three female patients suffering from pulmonary disturbances and is tentatively placed in group II of Stovall and Bubolz [*R.A.M.*, xii, p. 691]. In two out of the three cases the fungus was implicated as the primary agent of infection, and it is suggested that it

should receive consideration as one of the many potential agents in the wide group of ailments clinically known as 'chronic bronchitis' [ibid., xii, p. 692; cf. also xiii, p. 162].

AMSTUTZ (O. C.). **Otomycosis: report of case.**—*Journ. Amer. Med. Assoc.*, cii, 19, p. 1562, 1934.

Clinical details are given of a case of otomycosis, associated with the presence in the meatus of *Aspergillus niger* [*R.A.M.*, xii, p. 631] and *Rhizopus nigricans*, in a young woman in a district of Ohio where the condition was previously unknown.

CATANEI (A.). **Études sur les teignes.** [Studies on ringworms.] —*Arch. Inst. Pasteur d'Algérie*, xi, 3, pp. 267–399, 13 pl., 5 figs., 8 diags., 1933.

An exhaustive and fully documented account is given of the writer's epidemiological, clinical, parasitological, and experimental studies on human juvenile ringworms in Algeria, references to which have appeared from time to time in this *Review*.

The examination of 670 cultures from the scalps of children affected by trichophytosis in the three main divisions of the country, namely, Littoral Tellien, Hauts-Plateaux, and Sahara, indicated that 94 per cent. of the infection is due to *Trichophyton violaceum* and *T. glabrum* [*R.A.M.*, xii, p. 510], nine other species of this genus being occasionally involved. Two species of *Microsporon* were isolated, viz., *M. audouini* and *M. tardum*. Two strains of Sabouraud's *Microïde* group (*Ann. de Dermatol.*, Sér. 6, x, p. 236, 1929) were also obtained and are referred to *T. radiolatum* (*T. mentagrophytes*) [*R.A.M.*, xi, p. 373; xii, p. 695; xiii, p. 512].

Inoculation experiments were carried out on a number of domestic and laboratory animals and a study was made of the hitherto undescribed effects of the recently described *T. gourvili* [ibid., xii, p. 511] and *T. pruinosum*, as well as of the pathogenicity, not heretofore determined, of *T. glabrum*, *T. violaceum*, *T. langeroni* [ibid., xi, p. 576], and *T. soudanense*. Notes are given on the cultural and other characters of *Achorion schoenleini*.

DAVIDSON (A. M.) & GREGORY (P. H.). **In situ cultures of dermatophytes.**—*Canadian Journ. of Res.*, x, 4, pp. 373–393, 2 pl., 24 figs., 1934.

A comprehensive account is given of the writers' studies on the correlation between the morphology and certain phases of the life-cycle of four common fungi causing skin disease in man, viz., *Microsporon audouini*, *M. felineum* [*R.A.M.*, xiii, p. 96], *Trichophyton gypseum*, and *Achorion schoenleini*. It was found that in all cases the life cycle can be divided into a parasitic and saprophytic stage. Hairs naturally infected by the three first-named organisms and scutula containing the last were placed, without any nutrient medium, in van Tieghem cells at various humidities regulated by osmotic solutions of known vapour pressure. Under these conditions the above-mentioned dermatophytes were found

to undergo a second period of growth, resulting in the development of all the highly differentiated spore forms—aerial hyphae, aleuriospores, fuseaux, and spirals—hitherto known only in artificial cultures on various media. Morphologically these bodies differed sufficiently in the four organisms to permit the species to be distinguished from one another. It is suggested that the saprophytic phase, initiated in nature when the infected tissues fall from the body in a moist situation, may be of significance in the epidemiology of the dermatomycoses.

KAMBAYASHI (T.). **Über ein von einer Spezies der Malbranchea hervorgerufenes Hautleiden in China.** [On a skin disease produced by a species of *Malbranchea* in China.]—*Arch. für Dermatol.*, clxx, 1, pp. 97–106, 50 figs., 1934.

From the squamae of the nose and temporal region of a boy suffering from a trichophytoid skin eruption near Shanghai the writer isolated a species of the very rare genus *Malbranchea*, established by Saccardo in 1882 with the type species *M. pulchella* Sacc. et Penz., to which the sole addition hitherto has been *M. bolognesi-chiurcoi* Vuillemin [*R.A.M.*, vi, p. 483]. The present fungus differs both in clinical features and in certain morphological characters from the last-named despite a strong general resemblance, and is accordingly designated *M. kambayashii* n. sp. It is characterized on glucose agar by a profuse, compact mycelium composed of creeping, tortuous, branching, septate, hyaline hyphae, 2 to 3 μ in diameter; the conidia produced in chains from the apices of the semi-circularly curved conidiophores are hyaline, long-cylindrical, polygonal, and measure 3 to 5·5 by 2·5 to 4 μ. The fungus exerted a virulently pathogenic action on the internal organs of laboratory animals.

BERTACCINI (G.). **Contributo allo studio della cosidetta 'blastomicosi sud-Americana'.** [A contribution to the study of the so-called 'South American blastomycosis'.]—*Giorn. Ital. di Dermatol.*, lxxv, 2, pp. 783–828, 9 pl., 1934.

An exhaustive account is given of a fatal case of South American blastomycosis in a repatriated Italian emigrant, who contracted the disease in Brazil. The causal organism was extremely difficult to isolate from the lesions (which involved the cheeks, mouth, throat, middle ear, and brain). It was grown on various standard solid and liquid media by Prof. Redaelli, who diagnosed it as a new species of *Scopulariopsis* [cf. *R.A.M.*, xiii, p. 303], *S. bertaccini*. The fungus, which develops best between 22° and 26° C., is characterized in hanging drop cultures by straight, hyaline, septate, sterile hyphae, 3·5 to 4 μ in diameter; branched, tortuous, fertile hyphae, 1·5 to 3 μ in diameter, from which arise erect, clavate, hyaline conidiophores (phialides), 4 to 10 μ long, at the tips of which are abstricted singly or in chains of five or six, round to slightly oval, smooth, light brown conidia, 3·5 to 4 μ in diameter. Round or distorted intercalary and terminal chlamydospores, 20 to 25 μ in diameter, are also formed. Inoculation experiments with a conidial suspension of the new fungus gave positive results on guinea-pigs.

The taxonomic and clinical aspects of blastomycosis are fully discussed in the light of contemporary research.

GREAVES (F. C.). **Coccidioidal granuloma with lesions in the small intestine.**—*U.S. Naval Med. Bull.*, xxxii, 2, pp. 201–204, 1934.

Oidium coccidioides [*Coccidioides immitis*: *R.A.M.*, xiii, p. 511] was isolated from lesions in the small intestine of a male negro who died as a result of the disease in 1933, this being apparently the first record of the occurrence of the fungus in the particular site under observation.

CIFERRI (R.) & REDAELLI (P.). **'Coccidioides immitis et Paracoccidioides brasiliensis' comme producteurs d'ammoniaque aux dépens des substances azotées.** [*Coccidioides immitis* and *Paracoccidioides brasiliensis* as producers of ammonia at the expense of nitrogenous materials.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 4, pp. 126–128, 1934.

From the authors' studies of the nutritive requirements of *Coccidioides immitis* (strains Castellani and Weidman N. 1091) and *Paracoccidioides brasiliensis* (Splendore Almeida, strain Almeida N. 2) it is concluded that the former is a common saprophyte of the soil and vegetation, producing ammonia at the expense of proteids and able to infect human beings and domestic animals [see preceding abstract].

SARTORY (A.), SARTORY (R.), MEYER (J.), & MEYER (M.). **Deux cas d'ostéites dues, d'une part, au Sporotrichum gougeroti et, d'autre part, à une levure.** [Two cases of osteitis due, on the one hand, to *Sporotrichum gougeroti* and, on the other, to a yeast.]—*Ann. Inst. Pasteur*, lii, 4, pp. 424–443, 9 figs., 1934.

A comprehensive account is given of the writers' clinical, morphological, and biochemical studies at Strasbourg on *Sporotrichum gougeroti* [*R.A.M.*, xii, p. 569] and a species of *Schizosaccharomyces*, each of which was responsible for a case of osteitis [cf. ibid., x, p. 106], the former involving the left tibiotarsal region in a young woman and the latter the left tibia in a 14-year-old girl.

GRIMES (M.) & HENNERTY (A. J.). **A study of the quantitative changes in the microbiological flora of sweet-cream salted butter of good keeping quality when held at 15° F. for a period of two to eight months.**—*Journ. Dairy Res.*, v, 2, pp. 137–143, 1934.

A fully tabulated account is given of the writers' researches at the Institute of Dairy Bacteriology, University College, Cork, on the quantitative changes in the microflora of sweet-cream salted butter stored at 15° F. for two to eight months. There was a marked increase in the yeast count, frequently without any corresponding impairment of the keeping quality of the samples, whereas the numbers of *Oidium* [*Oospora*] *lactis* [*R.A.M.*, xiii, p. 511] present tended to decrease progressively with the period of storage.

LOFTUS-HILLS (G.), SCHARP (L. R.), & BELLAIR (T.). **A study of factors influencing the keeping quality of some Victorian salted butters in cold storage.**—*Journ. Dairy Res.*, v, 2, pp. 124–136, 1 diag., 3 graphs, 1934.

The writers discuss and tabulate the results of their bacteriological and chemical examination at Melbourne of 70 boxes of salted butter stored at 12° F. for three months with a view to determining the factors controlling deterioration in the consignments destined for the English market. No positive correlation could be detected between the counts of bacteria, yeasts, and moulds and keeping quality [cf. preceding abstract], which appears to depend rather on the combined effects of copper content and acidity.

HENRY (A. W.). **Observations on the variability of Polyspora lini.**—*Canadian Journ. of Res.*, x, 4, pp. 409–413, 2 pl., 1934.

Polyspora lini [*R.A.M.*, xi, p. 784], the agent of browning and stem-break of flax, was isolated from material procured from Ireland, Sweden, the United States, and Canada. Cultural differences in pigmentation and growth characters were observed between the various strains on potato dextrose, maize meal, and prune agars.

Most of the parent cultures produced saltants in the form of sectors, the Irish strain being particularly prolific in this respect. New strains differing from the parents and others in cultural characters originated in this manner and in many cases also produced sectors. Saltation was equally prevalent in mono- and polysporous strains. Most of the original isolations yielded a special form of the fungus characterized by the production on all the media tested of firm, tough colonies composed of abundant, densely packed mycelium and relatively sparse spore development, in contrast to the typical soft, loose, freely sporulating growth of the ordinary form. Strains of the new form of *P. lini* have arisen by saltation either as sectors or islands in colonies of the ordinary form, and so far they have shown no tendency towards reversion to the parental type even after long culture on artificial media or passage through the host.

Preliminary pathogenicity tests on the susceptible Bombay C.I. 42 and other Indian selections and the resistant Winona and Ottawa 770 B indicate that the same flax variety may differ in its reaction to the various strains of *P. lini*.

BONGINI (VIRGINIA). **Essiccamento anulare del fusto in piantoni dei vivai.** [Annular desiccation of the stem in nursery stock.]—*La Difesa delle Piante*, xi, 2, pp. 62–67, 1 fig., 1934.

The practice adopted in Piedmont during winter of protecting two- to four-year old *Sophora*, *Cytisus*, *Robinia*, and *Laurocerasus* [*Prunus*] plants from frost by packing soil round the base of the trunks to a height of some 70 cm. has been found to cause 40 per cent. or more of the plants to wilt during the following summer. A dry, yellow, depressed area forms on the trunk just below the top of the protective covering of soil, growth declines, and premature defoliation sets in. The lesion rapidly enlarges, and the

cortical and cambial tissues as well as the outer xylem ring dry up. The cortex becomes wrinkled and bears conidiophores and conidia of *Botrytis cinerea*, to which the condition is attributed. It is recommended that the covering of soil should be replaced by loose straw.

DRAYTON (F. L.). **The Gladiolus dry rot caused by Sclerotinia gladioli (Massey) n. comb.**—*Phytopath.*, xxiv, 4, pp. 397–404, 3 figs., 1934.

A complete technical diagnosis [in English] is given of *Sclerotinia gladioli* (Massey) n. comb. (syn. *Sclerotium gladioli*) based on apothecia obtained in culture as a result of fertilization, by the microconidia, of the receptive bodies as already reported [*R.A.M.*, xiii, p. 461]. The apothecia are densely caespitose, stipitate, 6 to 10 mm. high and 3 to 7 mm. broad, with a cinnamon-brown disk and chestnut-brown stipe (Ridgway); the hymenial surface is umbilicate, convex-discoid, the margin strongly reflexed, deeply crenate, sometimes entire or convolute, the lower surface tomentose, and the context thick, prosenchymatous, infundibuliform, with a definite hypothecium. The cylindrical to clavate asci, opening by a pore, measure 190·5 to 235·4 by 8·5 to 9·2 μ, average 212·5 by 9·06 μ, and contain eight unicellular, uniseriate, ellipsoidal, hyaline, uninucleate ascospores, 10·2 to 16·75 by 5·6 to 9·5 μ, average 14·04 by 7·25 μ, mode 13·5 by 7·25 μ. The paraphyses are abundant, filiform to slightly clavate at the apex, septate, hyaline, and measure 2·8 to 3·2 μ in diameter. The sclerotia and sexual elements are also described [loc. cit.]. The organism is known to occur in the United States, Canada, Great Britain, Holland, Germany, France, and New Zealand, causing dry rot of all cultivated varieties of *Gladiolus* and also affecting species of *Tritonia*, *Freesia*, *Lapeyrousia*, and *Crocus*.

HARRIS (M. R.). **A Phytophthora disease of Snapdragons.**—*Phytopath.*, xxiv, 4, pp. 412–417, 1 fig., 1934.

This is an expanded account of the author's study [*R.A.M.*, xiii, p. 31] on a wilt disease which attacked Roman Gold, Jenny Schneider, and Cheviot Maid snapdragons [*Antirrhinum majus*] in the San Leandro greenhouses, California, in 1932 and to which the first-named variety was particularly susceptible, over 75 per cent. of the plants being destroyed. The morphological characters of the *Phytophthora* responsible for the disease, consisting of terminal, ovate, papillate, pale yellow conidia, 30 to 45 by 20 to 25 μ, semi-spherical antheridia, spherical oogonia, and numerous oospores, indicate that it is closely allied to, if not identical with, *P. cactorum*.

Histological investigations showed that the epidermis was the first tissue to be invaded, after which the fungus rapidly traversed the cortex and phloem tissue, reached the cambium, and eventually made its way into the xylem, chiefly along the medullary rays. The progress of the organism was accompanied by the collapse into a brown, shapeless mass of all the cells except those in the xylem.

Infection was traced to the compost pile from which soil was taken at transplanting time, and complete elimination was achieved by half-an-hour's exposure to a steam pressure of 10 lb. in an autoclave.

WILKINS (F. S.) & WESTOVER (H. L.). **Turkestan Alfalfa as compared with Grimm for wilt-infected soils in Iowa.**—*Journ. Amer. Soc. Agron.*, xxvi, 3, pp. 213–222, 1934.

Of some 500 lots of lucerne used in yield trials since 1926 at the Iowa Agricultural Experiment Station, only the Turkestan, Hardistan, and Ladak varieties showed marked resistance to bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*: *R.A.M.*, xiii, p. 151]. The first-named, however, is particularly susceptible to leaf diseases which frequently cause drying and shedding of a considerable proportion of the foliage before harvesting. The three above-mentioned varieties can all be recommended for long rotations on wilt-infected soils, while Cossack, Grimm, Dakota, or Montana Common may be used in short sequences.

FAES (H.), STAEHELIN (M.), & BOVEY (P.). **La lutte contre les ennemis des arbres fruitiers, insectes et champignons en 1932.** [The campaign against the insect and fungous pests of fruit trees in 1932.]—*Landw. Jahrb. der Schweiz*, xlviii, 3, pp. 241–280, 1 col. pl., 8 figs., 1934. [German summary.]

The results [which are fully discussed and tabulated] of experiments in the control of apple and pear scab (*Venturia inaequalis* and *V. pirina*) in the cantons of Vaud and Valais, Switzerland, in 1932 [cf. *R.A.M.*, xii, p. 450] clearly demonstrated the value of the pre-blossom application. In wet summers two post-blossom treatments, one after petal-fall and another 15 to 20 days later, are inadequate and should be supplemented by at least one more in July, while a further application in August is recommended against late scab on the fruits. There is no doubt as to the superiority, from a fungicidal standpoint, of Bordeaux mixture over lime-sulphur, but in view of the serious damage liable to be inflicted by the former on apple leaves and fruits, the latter should be substituted for the two first post-blossom treatments, while for late applications cupro-Maag (150 to 200 gm. in 100 l. water) or a similar copper-containing product may be used [ibid., xiii, p. 171].

In 1929-30 Pomme d'Api apples stored in peat were less severely affected by scald than those enclosed in paraffined wraps [ibid., xi, p. 659], while the untreated fruit showed the highest incidence of the disorder.

Two to three applications of 1 per cent. Bordeaux mixture or 2 per cent. lime-sulphur gave good control of shot hole of cherries (*Clasterosporium*) [*carpophilum*], which was also effectively combated on peaches by the latter preparation at 1 per cent. and on apricots by four applications of 1 per cent. Bordeaux mixture.

Heavy damage was caused on cherry trees in different parts of Switzerland in 1932 by *Valsa leucostoma* [ibid., xiii, p. 183], possibly as a sequel to the very severe winter of 1928–9, when wounds and cracks developed in the bark and afforded entrance to the

spores. The branches in the upper part of the crown were shrivelled and destroyed by the fungus.

Control of orchard diseases and pests by spraying.—*New Zealand Journ. of Agric.*, xlviii, 4, pp. 209–217, 1 fig., 1934.

Recommendations are made, based on recent experimental data obtained in New Zealand, for the preparation and application of the principal spray fluids commercially used for the control of parasitic diseases and insect pests of orchard trees in the Dominion. Spray schedules are also given for pome and stone fruit trees.

CARTER (F. M.). **Investigation of factors affecting advance of certain 'Apple-spot' fungi within the host tissue.**—*Ann. of Botany*, xlviii, 190, pp. 363–394, 19 graphs, 1934.

This is a detailed account of the author's investigation, by methods identical with those used by Seth [*R.A.M.*, xiii, p. 524], of the chemical factors which affect the advance within the host tissues of apple-spotting fungi, as represented by *Pleospora herbarum*, *Polyopeus* sp., *P. purpureus*, *Alternaria* sp., *A. tenuis*, and *Fusarium* [*lateritium* var.] *fructigenum* strains A and D [ibid., xi, p. 52; xii, p. 184]. The results are presented in the form of tables and of curves obtained by plotting the radial spread of the fungi against varying concentrations and combinations in the standard medium of malic acid, glucose, sucrose, fructose, and nitrogen. It was shown that all the fungi tested spread very slowly in media containing over 0·4 per cent. malic acid, a fact which may probably explain the greater prevalence of fungal spotting in sweet than in sour varieties of apple. Within the limits of the tests, the rate of spread was not greatly affected by changes in the concentration of sugar or by the substitution of sucrose for glucose. The substitution of fructose for glucose had little effect on the spread of *Pleospora*, but favoured spread in *F. lateritium* var. *fructigenum* D and *Alternaria* spp. In *F. lateritium* var. *fructigenum* A it favoured spread at relatively low concentrations of malic acid, and retarded it at higher concentrations. No growth of any of the fungi was observed in media containing 0·3 per cent. malic acid combined with 9 per cent. fructose, indicating that fructose is partly responsible for the change in the order of attacking power of the two strains of *F. lateritium* var. *fructigenum* previously recorded as associated with increasing age of fruit [loc. cit.].

In all the fungi studied, in the absence of acid from the media, the curves representing the relationship between radial growth in nine days and nitrogen content tended to rise to a maximum at a nitrogen content little over zero, and then fell as the concentration increased, but in the presence of acid the fungi varied more widely in their response to nitrogen content. With the two strains of *F. lateritium* var. *fructigenum*, in particular, a change from 0·15 to 0·3 per cent. malic acid in the medium resulted in a reversal of the relationship between radial spread and nitrogen concentration for values ranging from 0·01 to 0·03 per cent. nitrogen. This would suggest that in apples of low acid content, the usual relationship

between radial advance of the fungus and nitrogen content of the fruit may possibly be reversed.

ZORN (R.). **Eine eigentümliche Krankheits-Erscheinung an Apfel-Pyramiden.** [A peculiar pathological manifestation on Apple pyramids.]—*Obst- und Gemüsebau*, lxxx, 5, p. 76, 2 figs. (1 on p. 77), 1934.

For some years past the writer's 14 Peter Heusgen's Gold Pippin apple pyramids, grafted in 1908 at the age of five years on Paradise stocks, have manifested peculiar warty excrescences which are gradually extending from the older to the younger parts and afford a suitable basis for the attacks of the canker fungus [*Nectria galligena*: *R.A.M.*, xiii, p. 523]. Possibly the fact that the scion comes into leaf much later than the stock variety may be concerned in this unusual development.

In an editorial note it is stated that the gnarled outgrowths in question are attributed by the Biological Institute to abnormal bud formation in the cambial region, possibly arising out of incompatibility between stock and scion.

ATANASOFF (D.). **Is bitter pit of Apples a virus disease?**—*Phytopath. Zeitschr.*, vii, 2, pp. 145–168, 9 figs., 1934.

This paper on the etiology of bitter pit of apples has already been noticed from another source [*R.A.M.*, xiii, p. 169].

CARNE (W. M.). **Wastage in Tasmanian Apples held for mainland markets.**—*Fruit World of Australasia*, xxxv, 4, pp. 195, 197, 1934.

In recent years the keeping quality of apples held in cool storage in Tasmania while awaiting shipment to the mainland of Australia has shown a general decline, chiefly owing to low temperature breakdown [*R.A.M.*, xii, pp. 35, 573] to which Cox's Orange Pippin, Sturmer, Scarlet, Jonathan, French Crab, and Ribston are locally the most susceptible varieties. The increase in this disorder may be due to heavier fertilizing and later picking.

To reduce the loss from this cause to a minimum, fruit from trees carrying apples which are, on the average, larger than the apples on trees with good crops should not be placed in cool storage, as large fruit are much the most susceptible to this type of injury. Jonathan and Scarlet should be picked when the 'ground' colour (i.e. the colour of the parts that are not red or flushed) is light green, Sturmer when it is changing from full to light green, and French Crab when the original green shows the first evidence of becoming lighter. Susceptible varieties should be stored at 35° to 36° F. or as near to this temperature as possible.

BURGERT (IRMA A.). **Some factors influencing germination of spores of Phyllosticta solitaria.**—*Phytopath.*, xxiv, 4, pp. 384–396, 1934.

This is an extended account of the writer's studies on the factors affecting sporulation in *Phyllosticta solitaria*, a condensed version of which has already been noticed [*R.A.M.*, xiii, p. 450].

NEUMANN (H.). **Birnenfäule, hervorgerufen durch Phytophthora cactorum Schroet.** [Pear rot caused by *Phytophthora cactorum* Schroet.]—*Obst, 1933*, pp. 257–258, 2 figs., 1933. [Abs. in *Bot. Centralbl.*, N.F., xxiv, 11–12, p. 384, 1934.]

The occurrence of *Phytophthora cactorum* on pears is reported, apparently for the first time in Austria [cf. *R.A.M.*, ix, p. 392; x, p. 214]. Weather conditions during the growing period are believed to have favoured the outbreak.

WAYNICK (MINERVA). **A rot of Pear caused by the red bread-mould fungus.**—*Journ. Elisha Mitchell Sci. Soc.*, xlix, 2, pp. 285–288, 2 figs., 1934.

In a study of a soft rot of pears (purchased in North Carolina) caused by the conidial form of a fungus identified by Dodge as sex B of his monilioid, pigmented form of the red bread-mould fungus, *Neurospora sitophila* [*R.A.M.*, xii, p. 625; xiii, p. 7], pears were inoculated with hyphae and conidia, some being stored at 20° C. and others at 35°. Two or three days later brown, decayed areas developed round the points of inoculation. Examination of the diseased tissues showed that the infected pulp cells remained intact as they separated and that the mycelium was intercellular. The hyphae passed between the parenchyma cells and were so abundant as to enclose them, but there was no evidence of intracellular invasion. The middle lamella was dissolved slightly in advance of the invading hyphae. In culture, using soluble starch in starch agar as the only nutrient, the fungus grew sparsely, and there was no evidence (as shown with iodine) that in cultures one week old any appreciable amount of starch had been utilized. Potato agar, however, supported a luxuriant growth. Acid formed in 1 per cent. dextrose and in 1 per cent. sucrose agar when the initial reaction was alkaline, indicating that each can serve as a food for the mould. Pectin was not utilized in any quantity. Examination of the affected tissues clearly showed that the primary membranes (calcium pectate) of the pulp cells serve as a food for the fungus; presumably, protopectins and some of their cleavage products can also be utilized.

BARTHELET (J.). **Sur une pourriture des fruits à pépins Phacidiella discolor (Mout. et Sacc.) Poteb.** [On a decay of kernel fruits, *Phacidiella discolor* (Mout. et Sacc.) Poteb.]—*Bull. Soc. Nat. Hort. de France*, Sér. 6, i, pp. 162–163, 1934.

Phacidiella discolor [*R.A.M.*, xii, p. 8] was observed in 1932 for the first time in France, causing a dry, black rot of pear fruits, which were attacked in their upper part. Sections through diseased fruits revealed a greyish-brown discoloration of the flesh which assumed a black tinge near the point of insertion of the pedicel. The fungus has been reported on pears and apples from Russia, Switzerland, Belgium, Denmark, Norway, and England; the perfect stage occurs only on the branches, the fruits bearing the greenish-grey pycnidia of *Phacidiopycnis malorum*. The organism is of purely secondary importance, except possibly on stored fruit.

CURZI (M.). **Lo 'Stereum purpureum' Pers. nel mal del piombo in Italia.** [*Stereum purpureum* Pers. in silver leaf disease in Italy.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 1, pp. 117–124, 1 pl., 3 figs., 1934. [English summary.]

In January, 1934, Regina Claudia Grande plums growing near Rome and affected with silver leaf for some five or seven years showed at the base of the trunks abundant fructifications of *Stereum purpureum* [*R.A.M.*, xiii, p. 385]. The hymenium was deep purple and the basidiospores measured 5·5 to 7 by 2·5 to 3·25 μ. This is the first record of the fructifications of *S. purpureum* on trees affected with silver leaf in Italy, their development in this instance being favoured by prevailing wet weather and the particular condition of the trees. It is thought that infection takes place through pruning wounds and chiefly during the winter when the fungus is able to sporulate.

REINKING (O. A.). **The distribution of Banana wilt.**—*Philipp. Journ. of Sci.*, liii, 3, pp. 229–243, 5 pl., 1934.

Banana wilt was found, during the writer's investigations from 1925–7, to occur in the Philippine Islands, Straits Settlements, Federated Malay States, Siam, Dutch East Indies, Australia, Burma, and India, and *Fusarium* [*oxysporum*] *cubense* [*R.A.M.*, xiii, pp. 251–2] isolated in every case from the diseased plants.

In Malaya the Embun variety (the ordinary Gros Michel of commerce) is widely and severely attacked, also Awak and Rastali (Manzana or Apple); in Siam the common Nam Wa (a type resembling Awak) is affected; in Java Ambon poetih (Gros Michel), Radja sereh (similar to Apple, Manzana, or Latundan, the only variety attacked in the Philippines) [also found by Gäumann to be susceptible to *Pseudomonas musae*: ibid., i, p. 225], and Radja sijem (resembling Nam Wa); in Burma, Kala (Latundan type); and in India, Kabari (Awak) and Sonkel Chanda. Banana wilt appears to be widespread in the Dutch East Indies, having been observed on two of the Banda Islands in the Molucca group. The disease in Java [loc. cit.], from typical cases of which *F. oxysporum cubense* was consistently isolated, does not appear to differ in any respect from that occurring in other parts of the world. In the Dacca district of Bengal, infection was particularly severe in garden plantings that had been cultivated for years around the farmhouses.

CARTER (W.). **Mealy-bug wilt and green spot in Jamaica and Central America.**—*Phytopath.*, xxiv, 4, pp. 424–426, 1934.

During the autumn of 1932 the writer investigated the situation in respect of mealy bug (*Pseudococcus brevipes*) wilt and green spot of the pineapple in Jamaica, Guatemala, and Spanish Honduras [*R.A.M.*, xii, p. 521]. Mealy bug wilt appears to be present in Jamaica, where the disappearance of the Smooth Cayenne variety and the gradual decline of Red Ripley may be attributed to this cause. The Cheese or Sugar Pine, now widely cultivated on the island, is highly resistant to the disease. Green spot occurred in Jamaica on the Cheese Pine, Porto Rican, San Clarke, and Cowboy varieties. Neither wilt nor green spotting was observed in Guate-

mala notwithstanding the prevalence of the mealy bug in the lowlands on the predominant Cheese Pine. In Spanish Honduras green spotting was detected only in a garden of the United Fruit Company near Progresso, to which material had been transferred from Hawaii, and wilt was absent. [In line 4 of the abstract of the author's previous paper (ibid., xii, p. 520), 'though not necessarily' should be inserted before 'following their feeding on infected plants'.]

GIGANTE (R.). **Ricerche sulla morfologia, la biologia e la posizione sistematica del fungo che è stato descritto come 'Macrophoma dalmatica'.** [Researches on the morphology, biology, and systematic position of the fungus that has been described as *Macrophoma dalmatica*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 1, pp. 125–172, 2 pl., 16 figs., 1934. [English summary.]

From olives growing in the vicinity of Rome and showing dark brown, depressed, circular or oval spots surrounded by a lighter raised margin the author isolated a *Sphaeropsis* which in culture on various media formed spherical or elliptical, ostiolate pycnidia, 125 to 275 (average 180) μ in diameter. The pycnospores measured 16 to 27 by 6 to 7 μ and were at first hyaline, thin-walled and able to germinate, thus presenting the characters of *Macrophoma dalmatica* [*R.A.M.*, xii, p. 707], but as they later turned brown and showed thickening of the walls they assumed the characters of a *Sphaeropsis*. It therefore appears that *M. dalmatica* is only an immature stage of the latter and the author accordingly renames it *S. dalmatica* (Thüm.) Gigante.

The hyaline and brown spores germinated in 1 per cent. glucose solution held at 25° C. after two to three and eight hours, respectively. Mercuric compounds at a concentration of 0·01 per cent. inhibited germination. The fungus grew better on neutral or acid than on alkaline media, inducing an alkaline reaction, and produced the hydrolytic enzymes amylase, pectinase, protease, lipase, and emulsin.

Inoculations of olives, pears, and apples with an aqueous suspension of the spores gave positive results only on wounded fruits.

WINKELMANN (A.). **Erprobte Mittel gegen Pilzkrankheiten.** [Tested methods against fungous diseases.]—*Biol. Reichsanst. für Land- und Forstw. Flugbl.* 74, 11 pp., 1934.

This is a compilation of the fungicides officially approved by the competent German authorities, arranged under the headings of seed disinfectants, spraying and dusting preparations, and soil disinfectants, with full directions for their use. A list of the principal fungous diseases with the various preparations effective in their control, together with brief recommendations for the application of the latter and of other sanitary measures, is appended.

BLODGETT (F. M.) & MADER (E. O.). **A method of recording the distribution of copper dusts or sprays on leaves.**—*Phytopath.*, xxiv, 4, pp. 418–422, 1 fig., 1934.

By pressing a moist paper treated with a solution of potassium ferrocyanide (2 gm. with 5 c.c. acetic acid in 100 c.c. water) on

potato leaves sprayed or dusted with copper compounds [against *Phytophthora infestans*] a brown precipitate is formed where reaction with the copper deposit takes place, which adheres to the paper in the form of spots corresponding in size and shape to those of the mixture on the leaf. After washing, the prints may be dried to form a permanent record. Using this method, it was found that the average gain in the percentage of leaf area covered by 400 lb. pressure (128 galls. per acre) was 38·3 ± 1·1 over 200 lb. (77 galls.), the average increase in yield being 36·5 bushels per acre.

MORSTATT (H.). **Über die Frage der Zunahme der Pflanzenkrankheiten.** [On the question of the increase of plant diseases.]—*Mitt. Biol. Reichsanst. für Land- und Forstw.*, 48, pp. 63–72, 2 graphs, 1934.

The writer examines and discusses the current standpoint that epidemic plant diseases are on the increase in Germany [cf. *R.A.M.*, xii, p. 578]. The conclusion reached is that there has been no actual rise in the incidence of destructive endemic diseases of recent years, the contrary impression being based on such factors as improved methods of observation, intensified financial competition, and higher standards of quality. On the other hand, there is no doubt that German agriculture is jeopardized by the introduction of plant pathogens from foreign countries.

SMITH (J. H.). **Remarks on the size of plant viruses.**—*Arch. für Exper. Zellforsch.*, xv, 2–4, pp. 454–456, 1934.

In connexion with a brief summary at the Cytological Congress held at Cambridge in August, 1933, of recent studies on the dimensions of some well-known plant and animal viruses, the writer concisely sums up the evidence for and against the 'living entity' theory of these organisms [*R.A.M.*, xiii, pp. 116, 475]. In his opinion the outcome of the investigations hitherto made on this problem does not justify the application to the viruses of the term 'living' in its ordinary connotation [see next abstract].

BECHHOLD (H.). **Enzyme oder Lebewesen?** [Ferment or living entity?]—*Kolloid Zeitschr.*, lxvi, 3, pp. 329–340; lxvii, 1, pp. 66–79, 4 graphs, 1934.

On the basis of studies conducted since 1930 by ultra-violet photography, ultrafiltration, and centrifuging on the dimensions of the ultra-microscopic agents of four human and animal diseases, six highly motile bacteriophages of various sizes between 90 and 20 $\mu\mu$, and tobacco mosaic [*R.A.M.*, xiii, p. 401], the writer concludes that the enzymatic conception of the viruses is no longer tenable, and that all the available evidence points to their inclusion within the ranks of living entities [see preceding and next abstracts].

HODER (F.). **Der gegenwärtige Stand der Bakteriophagenforschung.** [The present status of bacteriophage research.]—*Arch. für Mikrobiol.*, iv, 4, pp. 589–635, 1933.

The writer enumerates and briefly discusses the principal contributions since 1917, with special reference to those of the last

four years, to the literature on the bacteriophage problem under the headings of (1) occurrence, origin, and properties, (2) diagnosis and therapy, and (3) action and nature of the bacteriophage. Considering the material as a whole, it is felt that no decisive conclusion can be reached as to the essential character of the bacteriophage on the basis of present knowledge. However, the complexity of the phenomenon has been amply demonstrated and d'Hérelle's conception of the bacteriophage as a living entity appears scarcely tenable in the light of recent studies [see preceding abstracts].

A five-page bibliography is appended.

SMITH (K. M.). **The plant virus in the insect vector.**—*Arch. für Exper. Zellforsch.*, xv, 2–4, p. 459, 1934.

In a paper read before the Cytological Congress held at Cambridge in August, 1933, it was stated that three kinds of relationship exist between plant viruses and their insect vectors, namely, purely mechanical in which the virus is conveyed at random on the mouthparts; semi- or group-specific, as in the case of viruses spread exclusively by leafhoppers (Jassidae), whiteflies (Aleyrodidae), or thrips (Thysanoptera); and specific, in which a particular virus is transmissible exclusively by a single insect vector, e.g., aster yellows by *Cicadula sexnotata* [*R.A.M.*, xii, p. 446], curly top of sugar beet by *Eutettix tenella* [ibid., xiii, p. 285], and false blossom of cranberry by *Euscelis striatulus* [ibid., xiii, p. 249].

Strong presumptive evidence is available for the multiplication of the virus in the body of the insect vector, and the vectors of several diseases remain infective for long periods without renewed access to a source of infection. The duration of infectivity may be correlated to some extent with the length of time of feeding on diseased material and the amount of the virus ingested.

It is noteworthy that many of the insect-borne viruses are readily adsorbed by certain substances and very short-lived *in vitro*.

LOEWENTHAL (H.). **The cultivation of animal and plant viruses.** —*Arch. für Exper. Zellforsch.*, xv, 2–4, pp. 403–404, 1934.

After a very brief résumé on the latest developments (since 1925) in the field of virus cultivation the author expresses the opinion that progress in the cultivation of plant, as opposed to animal, viruses has been delayed by the difficulty of finding a medium analogous to that made from blood plasma and extracts, and suggests that the use of some lately discovered growth-promoting substances might yield valuable results in this sphere.

REED (H. S.) & FRÉMONT (Mlle T.). **Les arbuscules des mycorhizes endotrophes.** [The arbuscles of endotrophic mycorrhiza.]—*Comptes rendus Soc. de Biol.*, cxvi, 18, pp. 201–202, 1934.

A cytological study was made in California of the arbuscles of the endotrophic mycorrhiza of citrus [*R.A.M.*, xii, p. 506]. On entering the host cell the lateral branch of the primary hypha immediately becomes enveloped by cytoplasm. From the host cell mitochondria and vacuolar elements migrate into the invading

mycelium in such a way that interpenetration between the plant and the endophyte is soon complete. The arbuscles thus arise from an almost perfect symbiotic relation between two living organisms. Ultimately they undergo atrophy and dissolution.

ROBERG (M.). **Über den Erreger der Wurzelknöllchen von Alnus und den Elaeagnaceen Elaeagnus und Hippophaë.** [On the agent of the root nodules of Alder and the Elaeagnaceae *Elaeagnus* and *Hippophaë*.]—*Jahrb. Wissensch. Bot.*, lxxix, 3, pp. 472–492, 1934.

A detailed, fully tabulated account is given of the writer's investigations at Münster University (Westphalia) on the etiology of the root nodules (rhizothamnia) of alder (*Alnus glutinosa*), *Elaeagnus* spp., and *Hippophaë rhamnoides* [*R.A.M.*, xii, p. 649]. Of the 600 seedlings grown in water cultures, gravel, or soil, 400 were inoculated with macerated root nodules from the various hosts under observation. The water-culture plants were grown from seed germinated in a nutrient solution containing nitrogen, transplanted to a nitrogen-free medium when 2 to 5 cm. high, and then inoculated, those grown in sand being similarly treated except for transplanting into sterilized sand. In the soil cultures a number of unsterilized soils were tested for the presence of organisms capable of producing the nodules, with positive results in several cases.

Root nodules were found to be produced in alder, *Elaeagnus* spp., and *H. rhamnoides* by two different organisms temporarily designated *Actinomyces alni* and *A. elaeagni* but without a description. Alders developed rhizothamnia only as a sequel to infection by *A. alni*, which had no effect on the other two plants, while *A. elaeagni* was capable of producing root nodules in *E.* spp. and *H. rhamnoides* but not in *Alnus glutinosa*. Elementary atmospheric nitrogen is fixed by alders, *E.* spp., and *H. rhamnoides* with the aid of their symbionts. The latter, however, were shown not to be essential for the growth of the hosts, which flourished equally well without inoculation provided nitrates were supplied in sufficient quantities. In contrast to Virtanen's observations on Leguminosae and alders in sand (*Ann. Acad. Fenn.*, Ser. A, xxxvi, 12; *Biochem. Zeitschr.*, cclviii, p. 106; *Act. Chem. Fenn.*, B, vi, 1933), the writer detected no diffusion of organically fixed nitrogen from the root nodules of the test plants into the surrounding liquid in water cultures, but this discrepancy may be partially attributable to differences in experimental conditions.

BERKNER [F.]. **Eisenfleckigkeit bei Kartoffeln. Wesentliche Sortenunterschiede — Abhängigkeit der Befallstärke von Jahreswitterung und Boden.** ['Eisenfleckigkeit' in Potatoes. Important varietal differences—dependence of the incidence of infection on the year's weather and on soil.]—*Mitt. für die Landw.* (formerly *Mitt. Deutsch. Landw.-Gesellsch.*), xlix, 18, pp. 378–380, 1934.

In connexion with recent attempts in Germany to substitute the wart [*Synchytrium endobioticum*]-resistant Erdgold potato for the susceptible Industrie, attention has been drawn to the liability of

the former to 'Eisenfleckigkeit' [*R.A.M.*, xiii, p. 467]. On an experimental farm under the writer's supervision near Breslau, it was recently necessary to sell for fodder a 5-hect. crop of Erdgold on account of the high proportion (10 per cent.) of diseased tubers, at a loss of M. 320 per hect.

In 1930 extensive trials were initiated on the reaction of over 200 potato varieties to 'Eisenfleckigkeit', the results of which (extending for the most part over a four-year period) indicated a high degree of resistance in 18 of the 85 wart-resistants tested, including Magdeburger Blaue, Maibutter, Goldappel, Juli, Cellini, Goldfink, Preussen, and Seydlitz, while six remained free from the trouble for the duration of the tests, namely, Frühe Hörnchen, Ambrosia, Kaiserkrone, Rotweissragis, Blaue Gelbfleischige, and Schlesien [Silesia]. The tendency towards 'Eisenfleckigkeit' is hereditary within a given variety, late sorts being predominantly affected; the disturbance is also more prevalent in large than in smaller tubers, so that the use of the former in varietal tests is important. One of the decisive environmental factors in connexion with the development of 'Eisenfleckigkeit' is the water balance, a disturbance of which in dry seasons and soils is accompanied by an access of injury. On 'acid' soils and with a 'physiologically acid' manuring schedule heavy applications of lime (20 doppelzentner per hect.) tend to reduce the amount of 'Eisenfleckigkeit'.

STEVENSON (F. J.) & CLARK (C. F.). **New Potato varieties.**—*Amer. Potato Journ.*, xi, 4, pp. 85–92, 1934.

Details are given of some promising new potato varieties recently developed through the co-operative researches of the United States Department of Agriculture and a number of State Experiment Stations. Two of the large number of varieties resistant to mild mosaic [*R.A.M.*, xiii, p. 465] have been named (Katahdin and Chippewa) and are being distributed. A high degree of resistance to the epidemic of late blight [*Phytophthora infestans*] in 1932 was shown at Presque Isle, Maine, by six selections of a progeny of Katahdin naturally fertilized. One heavily russeted seedling, 44537, proved more resistant to common scab [*Actinomyces scabies*] than any other varieties tested to date, not only in Maine but on heavily infested peat soil in Iowa. This potato, however, is such a low yielder compared with Irish Cobbler that it can only be recommended on soils where scab is a limiting factor.

SMALL (T.). **Report of the Mycologist.**—*Rapports aux États de Jersey pour l'année 1933*, pp. 30–48, 1934.

During 1933 the advantages of spraying potato crops against blight (*Phytophthora infestans*) were again demonstrated at several centres in Jersey [*R.A.M.*, xii, p. 549]. As in the previous year, apparently sound tubers from diseased plants developed the disease on keeping, except where the haulms had been killed before digging.

When freshly dug, healthy potatoes were inoculated with a spore suspension of *P. infestans*, packed in barrels in some of which holes were bored to secure ventilation, and sent to Weymouth and back, the percentage of diseased tubers in the holed barrels was

respectively, 14, 9, 12, and 10 per cent., as against 34 and 19 per cent. for the unventilated barrels; on a journey to Holyhead and back ventilation was, however, much less effective.

In boxes of apparently sound tubers taken from diseased, unsprayed crops but dipped in formalin the average loss per box was 5 tubers, as compared with 13 for similar, undipped potatoes, the corresponding figures in another test being 2 and 14. Potatoes from unsprayed crops not dipped gave a loss of 26 tubers per box, as against 2 for undipped tubers from sprayed healthy plants, while in a further experiment the losses per box for dipped and undipped tubers from an unsprayed, diseased crop, and undipped tubers from a sprayed, healthy crop were, respectively, 10, 17, and 1.

Experimental evidence was obtained that the spores of *P. infestans* may remain alive in the soil for at least a week; this period should, therefore, be allowed to elapse between cutting the haulms and digging the tubers. The fungus may also overwinter on the plants; in February, 1932, and January, 1933, it was present on volunteer potatoes outdoors.

Notes are also given on some tomato diseases.

HUSZ (B.). **Ueber die Zugehörigkeit von Phellomyces sclerotiophorus Frank und dessen Unterscheidung von Spondylocladium atrovirens Harz.** [On the identity of *Phellomyces sclerotiophorus* Frank and its differentiation from *Spondylocladium atrovirens* Harz.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 4, pp. 186–191, 3 figs., 1934.

A preliminary note is given on the writer's investigations in Hungary on silver scurf of potatoes, commonly attributed to *Spondylocladium atrovirens* [*R.A.M.*, xi, p. 670] with which *Phellomyces sclerotiophorus* has been regarded as synonymous. However, on the basis of a microscopical examination of the diseased tubers, it is concluded that *Colletotrichum atramentarium* [ibid., xiii, p. 467] is responsible for most of the damage and that *P. sclerotiophorus* is identical with this organism. Only *S. atrovirens* (which frequently occurs on the same tubers) is capable of producing the typical silvery lesions which have given the disease its name, but the spots caused by *C. atramentarium* are often whitish and thus liable to confusion with the foregoing. The conidia of *C. atramentarium* both on plum decoction agar and diseased potato stems measured (7 to) 12 to 23·5 by 3 to 5 μ, the pluriseptate setae being up to 200 μ in length and 4 to 5 μ thick at the base [cf. ibid., v, p. 447]. The 4- to 7-cellular conidia of *S. atrovirens* were found to measure 23 to 46 by 6·5 to 8·5 μ. *C. atramentarium* develops much more rapidly than *S. atrovirens* in culture and it also differs from the latter in its capacity for growth on acid media.

CHU (H. T.). **Observations on the physiological characters of Phoma glumarum, the causal fungus of grain-blight of Rice plant.**—*1932 Year Book Bureau of Entom.*, Hangchow, China, pp. 192–198, 2 figs., 1933. [Chinese, with English abstract. Received 1934.]

Grain blight of rice (*Phoma glumarum*) [*R.A.M.*, xii, p. 395] is

stated to be very prevalent in the Chekiang district of China, causing losses of 25·33 per cent. in 1932. The physiological aspects of the disease are here discussed with a view to possible control.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon, 1933.**—*First Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 1, pp. 17–19, 1934.

In 1933, *Fomes lignosus* continued to be the chief source of loss on *Hevea* rubber plantations situated in wet parts of Ceylon [*R.A.M.*, xii, p. 591], where attacks by *Ustulina zonata* were also important. The diseases caused by *Phytophthora palmivora* [ibid., xii, p. 77] were not unduly severe; adequate control measures against the bark rot caused by this fungus have been taken on most well-managed estates and the position as regards the canker and secondary leaf fall due to it causes no apprehension. A considerable and disquieting extension of the areas at mid-country elevation severely affected with *Oidium* leaf disease [*O. heveae*: ibid., xii, pp. 323, 655] took place, apparently as a result of the acclimatization of the fungus.

O'BRIEN (T. E. H.). **Paranitrophenol in crêpe manufacture.**—*First Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 1, pp. 1–2, 1934.

The Rubber Research Scheme (Ceylon) is unable to recommend the continued use of paranitrophenol (P.N.P.) in the preparation of crêpe rubber, manufacturers having recently objected to it on the ground that it causes staining of certain coloured goods and wrapping paper. In tests of a commercial sample of crêpe staining of wrapping papers did in fact occur, and though there was no staining of rubber articles a coloured extract could always be obtained from them by soaking them in water. No objection has been raised to the use of P.N.P. as a mould preventive in smoked sheet [*R.A.M.*, xi, p. 802].

REINKING (O. A.) & MANNS (M. M.). **Parasitic and other Fusaria counted in Colombia soils.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 25–26, pp. 502–509, 1934.

The following species of *Fusarium* were isolated from Colombian soils in 1930–2 by methods which have already been described [*R.A.M.*, xiii, p. 128]: *F. dimerum*, *F. chlamydosporum*, *F. semitectum*, *F. equiseti* var. *bullatum*, *F. scirpi* and its var. *caudatum*, *F. moniliforme* [*Gibberella moniliformis*], *F. orthoceras* and its var. *triseptatum*, *F. bulbigenum*, *F. oxysporum* and its form 5, *F. solani* vars. *minus* and *martii* f. 1, and *F. javanicum* var. *theobromae*.

Practically all the soil samples examined came from the top six inches of the soil of areas planted with bananas. The most prevalent of the above-mentioned organisms was *F. solani* var. *martii* f. 1 (49·7 per cent. of the total number of isolations), followed by *F. equiseti* var. *bullatum* (14·7), *F. scirpi* (12·4), *F. chlamydosporum* (8·9), *F. bulbigenum* (5·2), and *F. oxysporum* f. 5 (3·5), the remainder probably being for the most part mere soil invaders.

REINKING (O. A.). **Interesting new Fusaria.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 25–26, pp. 509–514, 4 figs., 1934. [German summary.]

Latin diagnoses are given of four new representatives of the form genus *Fusarium*, viz., *F. tumidum* Sherb. var. *humi*, *F. sublimatum*, *F. elongatum*, and *F. concolor*, of which the three first-named were isolated from the upper soil layers of banana and cacao plantations in Central America, while the fourth was collected on foot-rotted barley in Uruguay.

REINKING (O. A.). **Parasitic and other Fusaria counted in Costa Rica and Panama soils.**—*Zentralbl. für Bakt.*, Ab. 2, xc, 1–4, pp. 4–17, 1934.

Further investigations were conducted on the lines of those already described for Honduras, Guatemala, and Colombia [*R.A.M.*, xiii, p. 128 and preceding abstracts] to determine the relative prevalence and distribution of *Fusarium* spp. in the various soil types comprising the lowland banana regions of Costa Rica and Panama. The following were the most widespread organisms: *F. dimerum*, *F. sublunatum*, *F. decemcellulare* [*Calonectria rigidiuscula*], *F. equiseti* var. *bullatum*, *F. bulbigenum*, *F. oxysporum* forms 3 [formerly *F. cubense*] and 5, *F. solani* var. *martii* f. 1 (predominating in every soil type examined regardless of flora), *F. solani* var. *eumartii*, and *F. javanicum* var. *theobromae*.

It is of interest to note that in this survey, unlike those earlier reported, some of the soils from which samples were taken had not been under bananas for ten years, and further that *C. rigidiuscula*, originally recorded on cacao, was common in the vicinity of this crop. *Gibberella saubinetii* (*F. graminearum*) was isolated from the soil round badly diseased bananas for the first time in Panama. Adjacent to the bananas was a maize plot from which the fungus may have spread. Under tropical conditions it undoubtedly behaves as a definite soil invader.

RAO (Y. V. S.). **Contributions to the physiology of Sandal (Santalum album, Linn.). Part II. Influence of host on the nitrogen metabolism of Sandal.**—*Journ. Indian Inst. Sci.*, xvi A, 15, pp. 178–184, 1934.

Sandal (*Santalum album*) without a host was found, in the author's studies near Bangalore, South India, to resemble the spiked plant in its low protein and high water-soluble nitrogen content [*R.A.M.*, xiii, p. 198]. On the other hand, the ammonia content of hostless sandal is higher and the amide nitrogen lower than that of the host-fed plant. In this respect the hostless sandal differs from the spiked, the ammonia and amide contents of which are not significantly modified as compared with healthy individuals.

DODDS (H. H.) & FOWLIE (P.). **The effect of streak disease on the yield of Uba Cane. Part II.**—*South African Sugar Journ.*, xviii, 4, pp. 241, 243, 1934.

In 1932 the writers described the effect of streak disease [*R.A.M.*,

xiii, pp. 397, 472] on the plant cane and first ratoon crops of a field of Uba planted with alternate plots of streaked and healthy setts [ibid., xi, p. 603]. The second ratoon crop was harvested on 24th May, 1933, when a yield of 30·81 tons per acre was obtained from the originally streaked cane as compared with 33·47 from the originally healthy, representing a reduction from the disease of 7·95 per cent., the corresponding losses for 1931 (first ratoon) and 1929 (plant cane) being 10·33 and 11·24 per cent., respectively. The spread of streak from the diseased into the originally healthy plots has reduced the difference between the two series. Owing to the omission of roguing and of the selection of healthy setts, districts relatively free from streak ten years ago, such as parts of the Eshowe and Chaka's Kraal areas, are now widely infected. In the Inanda division, on the other hand, where systematic efforts have been made to combat streak, the fields have remained relatively free from the disease. In severely infested areas the sole practicable measure consists in the replacement of Uba by one of the newly released commercial resistant varieties, e.g., Co. 281, P.O.J. 2878, 2714, and 2727. Co. 290 and P.O.J. 2725 appear to be slightly less resistant than the foregoing, but sufficiently so to be useful substitutes for Uba under favourable conditions for their cultivation. CH 64/21 seems to be even more susceptible than Uba to streak in certain districts, and appreciably less tolerant, the loss in weight of a plant cane crop of the former variety in a recent experiment amounting to 29 per cent. compared with 10 to 12 per cent. in the latter.

ABBOTT (E. V.). **Seed rots of Cane in Louisiana.**—*Sugar Bull.*, xii, 4, pp. 6–7, 1933. [Abs. in *Internat. Sugar Journ.*, xxxvi, 424, p. 163, 1934.]

Red rot of sugar-cane cuttings used for seed, caused chiefly by *Colletotrichum falcatum* [*R.A.M.*, xii, pp. 679, 724] and to a less extent by *Melanconium sacchari* [*Pleocyta sacchari*: ibid., xii, pp. 246, 552], has become a serious problem in Louisiana as a result of the extensive failures due to it of P.O.J. 213, locally the leading commercial variety.

RAMSBOTTOM (J.). **Notes on mycological nomenclature.**—*Trans. Brit. Mycol. Soc.*, xviii, 4, pp. 314–319, 1934.

The author first deals with the dates from which nomenclature in the fungi starts; and also decides that Fries's *Elenchus* should be considered an integral part of his *Systema Mycologicum*. He then discusses at length Wiltshire's recent citation of '*Alternaria cheiranthi* (Fr.) Bolle excluding specimen'. Assuming that Wiltshire [*R.A.M.*, xiii, p. 326] is correct in his assertion that *Macrosporium cheiranthi* Fr. is an *Alternaria*, but not the same species that Bolle described and figured under the name of *A. cheiranthi* (Fr.) Bolle, he thinks that the latter citation will be permanently misleading for *M. cheiranthi* Fr.; and accordingly considers that the rules should be modified so as to allow of the citation *A. cheiranthi* (Fr.) Wiltshire.

UNAMUNO (L. M.). **Notas micológicas. VII. Algunos datos interesantes para la flora micológica española.** [Mycological notes. VII. Some interesting records for the Spanish mycological flora.]—*Bol. Soc. Española Hist. Nat.*, xxxiv, 2–3, pp. 133–146, 9 figs., 1934.

Continuing his series of taxonomic observations on fungi collected in different parts of Spain [*R.A.M.*, xiii, p. 183], the writer enumerates 41 species, four of which are described as new. The leaves of *Colchicum autumnale* were found to be attacked by *Tuburcinia colchici* (Schlecht.) Liro (*Urocystis colchici* Fcl) [ibid., ii, p. 54; iv, p. 210], producing longitudinal, black stripes. The spores are arranged in globose or oblong glomerules, 20 to 30 by 16 to 20 μ, the smooth, pale chestnut, central, fertile spores, 1 to 5, generally 2 to 4 in number, measuring 10 to 15 μ in diameter, while the peripheral, sterile ones, which are pale yellow with a slightly darker membrane, are of variable dimensions, usually 5 by 4 to 8 μ. This is a new record for Spain.

UNAMUNO (L. M.). **Contribución al estudio de los hongos microscópicos de Galicia.** [A contribution to the study of the microscopic fungi of Galicia.]—*Rev. Acad. Cien. Madrid*, xxx, 3, pp. 460–518, 9 figs., 1933.

An annotated list is given of 198 microscopic fungi collected by the writer in Galicia, Spain, in 1931, of which 6 are new to science and 40 to the Spanish flora. Among the former may be mentioned *Septoria digitalicola* n. sp. and *Colletotrichum digitalis* n. sp., both on *Digitalis purpurea*; Latin diagnoses are given. *S. digitalicola* forms circular, brown spots with reddish-purple margins, 6 to 8 mm. in diameter, on both leaf surfaces. The fungus is characterized by sparse globose to ellipsoid, brown to fuliginous pycnidia, 25 to 86 by 20 to 65 μ, and continuous, hyaline, straight or curved conidia, rounded at both ends or somewhat tapering at one extremity, 12 to 20 by 3·5 μ. The round, diffuse, ochraceous-brown lesions produced on the leaves by *C. digitalis* frequently cover the entire surface. The fungus forms numerous black, gregarious acervuli, 88 to 100 by 28 μ, brown, septate, straight, curved, or flexuous, often nodular setae, 63 by 3·5 to 4 μ, and hyaline, cylindrical, usually straight, sometimes slightly curved conidia, rounded at both ends, and measuring 16 to 22 by 3 to 3·5 μ.

The numerous other interesting records include *Phyllosticta* (*Ascochyta*) *aceris*, which was found in association with *Phleospora aceris* forming numerous large, circular, pale ochraceous, reddish-bordered spots on the leaves of *Acer pseudo-platanus*, a new host for Spain; *Phyllosticta perniciosa*, a new record for Spain, sometimes occurred on the same leaves and caused considerable damage. *P.* (*Phoma*) *iridum* produced longitudinal, dark-edged lesions on the foliage of *Iris pseudacorus*, being new to the Spanish flora. *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xiii, p. 174] occurred on dry shoots of *Poterium magnolii* [*P. sanguisorba* or *Sanguisorba minor*], a new host for this fungus. *Fusicladium saliciperdum*, the conidial stage of *Venturia chlorospora* [ibid., xii, p. 355], was observed for the first time in Spain causing severe damage to willows (*Salix triandra*). *Macrosporium cookei*

(*M. solani* Cooke nec. Ell.) [*Alternaria crassa*], a new species for Spain, was found on *Datura stramonium* leaves [ibid., vii, p. 764].

BISBY (G. R.), BULLER (A. H. R.), & DEARNESS (J.). **Additions to the fungous flora of Manitoba II.**—*ex Thirteenth Ann. Rept. Canadian Plant Disease Survey 1933*, pp. 93–102, 1934. [Mimeographed.]

The 289 additions comprised in this second supplement to 'The Fungi of Manitoba' [*R.A.M.*, xi, p. 546] bring the total of known species in the province (1st November, 1933) to 2,400, exclusive of human and animal pathogens.

JØRSTAD (I.). **A study on Kamtchatka Uredinales.**—*Skr. Norske Vidensk.-Akad. Oslo I. Matem.-Naturvid. Kl., 1933*, 9, 183 pp., 22 figs., 1934.

A fully annotated list is given of 90 rusts collected in the Kamtchatka Peninsula, 81 of which were determined by the writer. Most of the Uredinales included are of very wide distribution, only 14 being confined to Asia, of which four are indigenous to Kamchatka [cf. *R.A.M.*, xiii, p. 398]. A seven-page bibliography and host and fungus indices are appended.

WILKINS (W. H.). **Studies in the genus Ustulina—with special reference to parasitism. I. Introduction, survey of previous literature, and host index.**—*Trans. Brit. Mycol. Soc.*, xviii, 4, pp. 320–346, 1934.

In this first instalment of his studies in the genus *Ustulina* the author gives a brief survey of the previous literature relating to the more widely known and presumably more economically important species of this genus, starting from the first recognizable mention of it by Michelli in 1729 down to 1932. A full, chronological and annotated list of the publications consulted is appended, as well as a host index, and an alphabetical index of the authors mentioned.

CASTELLANI (E.). **Recherches préliminaires sur la biologie de quelques Rhizoctones.** [Preliminary investigations into the biology of some species of *Rhizoctonia*.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 4, pp. 117–119, 1934.

After referring to earlier Italian work on endotrophic mycorrhiza [*R.A.M.*, iii, p. 539] and the relation between soil-inhabiting fungi and the higher plants [ibid., xi, p. 389; xii, p. 85] the author gives a brief account of his investigations on certain species of *Rhizoctonia* which, unlike those forming typical mycorrhiza on the Orchidaceae [ibid., xiii, p. 309], are weak parasites of the roots of various plants.

From eight species of phanerogams, mostly from Tuscany, the Apennines, and Emilia, eight strains of *Rhizoctonia* were isolated, each being considered by the author to represent a distinct species except one from *Cedrus* [*libani* var.] *deodara*, which was a variety of *R.* [*Corticium*] *solani* [see next abstract]. The strains fell into two groups; one grew copiously and developed a thick mycelium which rapidly turned brown and showed brown, occasionally very

large, sclerotia, while the other showed a transparent mycelium (which in a few instances finally became yellowish) with small, whitish sclerotia which much later became light brown. The first (and much more virulent) group included strains from potato (*R.* [*Corticium*] *solani*), *C. libani* var. *deodara* (*R. solani* var. *cedri*), lupin (*R. lupini*), and ash (*R. fraxini*); the second included those from *Viola palustris* (*R. alpina*), oak (*R. quercus*), and *Pinus insignis* (*R. pini insignis*). All the forms, except the last-named, grew well on ordinary media and all grew at a wide range of P_H values, though except for *R. lupini* and *R. pini insignis* the optima for which were, respectively, P_H 4·4 and 8·4, their optimum growth took place near neutrality. All tended to bring the liquid media to a constant, characteristic P_H value, and they all produced pectolytic enzymes; they liberated toxins which reduced the transpiration of wheat by causing necrosis of the roots and histological lesions in the tissues [ibid., x, p. 610].

CASTELLANI (E.). **Recherches morphologiques et systématiques sur quelques Rhizoctones.** [Morphological and systematic researches on some species of *Rhizoctonia*.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 4, pp. 119–121, 1934.

In this further note on the eight strains of *Rhizoctonia* isolated from the roots of various plants in Italy [see preceding abstract] the author states that he considers the genus to be very heterogenous, including as it does species forming part of the life-cycle of pycnidial fungi and others representing the vegetative stage of the Basidiomycetes. The former should be separated off and the genus divided into two further sub-genera (1) *Eurhizoctonia*, to include *R. crocorum* [*Helicobasidium purpureum*] and other similar species which, presumably, are part of the biological cycle of the lower Basidiomycetes with divided basidia, and (2) *Moniliopsis*, which includes *R.* [*Corticium*] *solani* and analogous species, all of which appear to have as their perfect form Basidiomycetes of the type of *Hypochnus* or *Corticium*.

The author's organisms are of the *Moniliopsis* type, of which he intends to give a new diagnosis. Six are new species. An analytical key is given to assist in their identification, based on their more stable morphological characters, but there is no full technical description.

SERVAZZI (O.). **Su alcune Pestalotia parassite facoltative di piante ornamentali.** [On some *Pestalozzia* facultative parasites of ornamental plants.]—*La Difesa delle Piante*, xi, 1, pp. 16–35, 4 figs., 1934.

Notes are given on the morphology, systematic position, and pathogenicity of a number of species of *Pestalozzia* isolated by the author from various ornamental plants in Piedmont during 1932–3, the records made including *P. vermiformis* on *Arbutus unedo*, *P. macrotricha* and *P. rhododendri* [*R.A.M.*, xi, p. 389; xii, p. 696] on species of *Rhododendron*, *P. funerea* [ibid., xii, p. 332] and *P. macrochaeta* on *Araucaria imbricata*, *P. michineri* on *A. brasiliana*, *P. conspicua* n. sp. on *Stanhopea tigrina*, *P. microspora* on *S. oculata*, and *P. clusiae* on *Cymbidium lowianum*.

From a study of the literature and his own observations the author concludes that *P. macrotricha* and *P. rhododendri* are weak parasites, *P. vermiformis* and *P. funerea* pure saprophytes, *P. macrochaeta* and *P. michineri* hemiparasites, and *P. conspicua*, *P. microspora*, and *P. clusiae* saprophytes or, at most, weak parasites.

A bibliography of 41 titles is appended.

LEDINGHAM (G. A.). **Zoospore ciliation in the Plasmodiophorales.** —*Nature*, cxxxiii, 3362, p. 534, 1 fig., 1934.

The zoospores of *Plasmodiophora brassicae* and *Spongospora subterranea* are habitually described as uniciliate [*R.A.M.*, x, p. 3; cf. also xii, p. 468], but on staining by Cotner's method (*Bot. Gaz.*, lxxxix, p. 295, 1930) another cilium, shorter and less conspicuous than that apparent in the living zoospore, may be detected. Large numbers of such biciliate zoospores were obtained by germinating, in dilute inorganic nutrient solutions, resting spores that had previously been repeatedly wetted, frozen, and dried.

MEURS (A.). **Parasitic stemburn of Deli Tobacco.**—*Phytopath. Zeitschr.*, vii, 2, pp. 169–185, 19 figs., 1934.

During 1932–3 the writer carried out extensive cultural studies at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, Holland, on three of the four *Pythium* species causing stem burn of tobacco in Sumatra, namely, *P. aphanidermatum*, *P. myriotylum*, and *P. deliense* n. sp. [*R.A.M.*, vi, p. 445; xiii, p. 475].

The terminal, smooth, globose oogonia of *P. aphanidermatum* [ibid., xiii, p. 399] measure 16·7 to 28·7 μ, mostly 20 to 25·1 μ, average 22·9 μ; the generally intercalary, barrel- or dome-shaped, diclinous antheridia, which are usually single, rarely two to an oogonium, measure 8·7 to 16·3 μ, mostly 11·4 to 14·3 μ in diameter in the distal portion and 13·8 to 31 μ in length; and the smooth oospores range from 15·6 to 26·2 μ, mostly 18·7 to 22·5 μ, average 20·5 μ.

Drechsler's diagnosis of *P. myriotylum* [ibid., x, p. 211] is recapitulated. The sporangia frequently include a number of swollen lobulate or digitate elements, 10 to 175 by 7 to 17 μ, from which the evacuation tubes, 10 to 100 by 2 to 3·5 μ at the base, arise. The terminal or intercalary, subspherical oogonia measure 15 to 44 μ in diameter (average 26·5 μ), and are provided with 3 to 6 or up to 10 clavate, crook-necked or arched antheridia, 8 to 30 by 4 to 8 μ, mostly 8 to 16 by 4·5 to 7 μ, borne terminally or inclining laterally on branches more or less closely enveloping the oogonium, proceeding from one to three parent hyphae not demonstrably connected with the oogonial filament. The subspherical, hyaline or yellowish oospores measure 12 to 37 μ in diameter, 12 to 26 μ in abundant development, mostly 18 to 24 μ (average 20·8 μ). The oogonia in the writer's strains of *P. myriotylum* are slightly larger than those described above, ranging in diameter from 21·2 to 38·1 μ, mostly 26·1 to 32·1 μ (average 28·6 μ). This species was referred by Van Hall to *P. polyandrum* [ibid., iv, p. 595], the latter name, however, being considered a *nomen nudum* in the absence of a description.

The terminal, rarely intercalary sporangia of *P. deliense* measure up to 210 μ in length and are of variable diameter, though always larger than the parent hypha; digitate branching seldom occurs. The discharge tube is mostly terminal, of very variable length (21 to 303·7 μ); from 3 to 25 zoospores, 8 to 12 μ in diameter, are formed in a vesicle. The terminal, smooth, globose oogonia vary from 15·1 to 23·1 μ in diameter, mostly 16·2 to 20 μ (average 18·2 μ); the single intercalary or terminal antheridium (rarely two) ranges from 12·8 to 27 by 4·7 to 15·5 μ, mostly 14·1 to 20·3 by 8·1 to 11·4 μ, the antheridial branch usually being straight while the oogonial hypha arising from it is strongly bent towards the antheridium. The smooth oospores range in diameter from 12·5 to 17·5 μ, mostly 13·7 to 16·2 μ, average 14·8 μ. This species is closely related to *P.* (*Nematosporangium*) *indigoferae* Butler [ibid., xi, p. 129], the differences between them being briefly indicated. It also seems probable that Van Breda de Haan's *Phytophthora nicotianae* is based on a mixed culture as already suggested by Ashby [ibid., vii, p. 601], and that the oospore-forming component was identical with *Pythium deliense*.

The symptoms of parasitic stem burn are described, its history briefly reviewed, the distribution of the causal organisms in tobacco-growing districts tabulated, and the control measures devised by Jochems summarized [ibid., vi, p. 446].

VAN SCHREVEN (D. A.). **Uitwendige en inwendige symptomen van boriumgebrek bij Tabak.** [External and internal symptoms of boron deficiency in Tobacco.]—*Tijdschr. over Plantenziekten*, xl, 4, pp. 98–112; 5, pp. 113–128, 3 pl., 1934. [English summary.]

Rhenen tobacco plants grown in nutrient solutions without boron or in glass-sand washed for 24 hours with concentrated hydrochloric acid developed the typical symptoms of boron deficiency, including weakness and discoloration of the root system, death of the growing point and axillary buds, thickening, chlorosis, and wrinkling of the leaves, often with downward bending of the main and lateral veins, discoloration of the vascular tissue, and stunting. The transference of healthy mature plants to a medium deprived of boron may be followed either by the development of wrinkling in the upper foliage or merely by the shedding of the flowers and death of the axillary buds, with little or no stunting. In the sand cultures not washed with hydrochloric acid there was a marked bending over of the top of the stem but the top did not fall off as often occurs in the 'top disease' found in Deli, Sumatra [*R.A.M.*, xi, p. 480], possibly because the plants were not grown in the open. The general similarity of the two conditions, however, is considerable. Some traces of boron were evidently contained in the glass-sand prior to its treatment with hydrochloric acid, since plants grown in sand not washed with the acid developed comparatively well.

Starch translocation is impeded in plants suffering from boron deficiency, which further show a brown discoloration and disorganization of individual cells or cell groups in the apical and procambial regions. When the whole root system is involved the top of the

plant is already dead, but the axillary buds continue to develop until the boron supply is exhausted. The disturbance gradually extends to the base of the buds, the stem nodes, and the vascular tissue of the main leaf veins. The phloem is immensely enlarged by extensive radial division, the cells often being irregularly distorted or compressed and broken down. The xylem is usually poorly developed and contains disintegrated cells. The ground parenchyma, epi-, endo-, or exodermis, collenchyma, and pericycle cells may all be similarly affected by a brown discoloration followed by disintegration. An excess of calcium oxalate crystals is frequently found.

The unilateral growth and bending of the stems is readily explicable by a local disorganization of the stelar structure, which prevents the normal elongation of the cells of one side. Similarly, the curvature of the leaf veins is due to the contraction of the phloem on the under side, a phenomenon characteristic also of tobacco curl and crinkle [ibid., xii, p. 474]. The thickening of the leaf blade arises from the enlargement of the individual cells, the chloroplasts in which are smaller than those of healthy tissue and supply correspondingly less chlorophyll—hence the chlorotic areas of the leaf. Diseased plants are richer in starch and sugars than healthy ones, presumably owing to the obstruction of transport through the disorganized phloem. The nucleus may be enlarged in the diseased mesophyll cells.

Secondary factors involved in the root, stem, and leaf deterioration associated with boron deficiency include the poisoning of the plants by the immobilization of sugars and proteins combined with impaired absorption and distribution of the elements requisite for normal growth.

GRANT (T. J.). **The host range and behavior of the ordinary Tobacco-mosaic virus.**—*Phytopath.*, xxiv, 4, pp. 331–336, 3 figs., 1934.

In a series of inoculation experiments with ordinary tobacco mosaic at Wisconsin University on 121 non-Solanaceous species of plants representing 40 families and 104 genera, 29 species were found to be susceptible, including buckwheat, garden and sugar beets, spinach, New Zealand spinach (*Tetragonia expansa*), mustard (*Brassica alba*), turnip, beans (*Phaseolus vulgaris*), carrot, foxglove (*Digitalis purpurea*), phlox, *Antirrhinum majus*, *Zinnia elegans*, and a number of other ornamentals, of which *Phacelia whitlavia* showed systemic symptoms of a type very similar to those exhibited by tobacco, spinach being similarly affected. In other hosts the symptom expression was local or erratic. The properties of the virus, as measured by thermal death point, tolerance to dilution, and ageing *in vitro*, were not appreciably influenced by the host in which it developed. In tobacco mosaic-infected spinach the concentration of the virus was apparently very low, but sap from healthy spinach and from certain other plants proved detrimental to the highly concentrated virus from tobacco. Low infection percentages from certain susceptible species are not necessarily, therefore, a result of low concentrations of the virus in such hosts. Cytological examination revealed the presence of cell inclusions,

consisting of 'X-bodies' and striate material [*R.A.M.*, xi, p. 796] in *P. whitlavia*, *Delphinium consolida*, *Linaria cymbalaria*, foxglove, spinach, and *Scrophularia marylandica*.

WOLF (F. A.), DIXON (L. F.), MCLEAN (RUTH), & DARKIS (F. R.). **Downy mildew of Tobacco.**—*Phytopath.*, xxiv, 4, pp. 337–363, 3 graphs, 2 maps, 1934.

A comprehensive account is given of the writers' studies in the United States on downy mildew (blue mould) of tobacco, which is attributed on the basis of morphological and taxonomic observations to *Peronospora nicotianae* Speg. [*R.A.M.*, xiii, p. 132].

The elliptical to oval, violet sporangia of the fungus, 15 to 28 by 12 to 18 μ, are borne on dendritic, four to eight times dichotomously branching sporangiophores, 400 to 750 μ in height, 10 to 12 μ at the base, terminating in curved, acute apices. Sporangial production begins with dawn and the organs are mature by sunrise. To the spherical oogonia, 60 to 85 μ in diameter, are applied bluntly clavate antheridia. The oospores are reddish-brown, 45 to 75 μ in diameter, with the wall thickened into low, blunt elevations and ridges and with a hyaline outer sheath, which collapses; they could not be induced to germinate. According to Angell and Hill (*Commonwealth Council Sci. & Indus. Res. Bull.* 65, 1932), the oospores (rarely found in Australia) measure 28 to 50 μ in diameter, while the dimensions recorded by Spegazzini are 50 to 80 μ. These workers, like the present writers, found that *Hyoscyamus niger* is immune from the pathogen causing downy mildew of tobacco, to which the name *H. hyoscyami*, therefore, appears inapplicable. On the other hand, the downy mildew organism is capable of parasitizing numerous species of *Nicotiana*, a fact that points to its identity with *P. nicotianae*. A further alternative is the possible occurrence of two species of *Peronospora* on tobacco, of which the downy mildew pathogen is so far undescribed. For the present, however, it seems advisable to use the name *P. nicotianae* for the latter.

Seedlings of all agricultural varieties of flue-cured tobacco seem to be equally susceptible to downy mildew, which has also been detected on tomato, pepper (*Capsicum annuum*), and eggplant in proximity to tobacco [*R.A.M.*, xiii, p. 191]. Penetration is accomplished by the entrance of the infection hyhae through the leaf stomata, the mycelium passing between the cells, the walls of which are penetrated by digitate haustoria. Within the dead tissues oospores are formed and mature four to seven days after the death of the cells in the infected tissues. The production of toxic water-soluble substances which spread throughout the plant is believed to be partially responsible for the high percentage of mortality (50 to 90 per cent. in 1932 and 1933) among transplanted seedlings.

The sporangia of *P. nicotianae* have been trapped at distances up to several miles from diseased seed-beds, indicating that they are air-borne. At Oxford, North Carolina, they were found a week before the outbreak of downy mildew in the tobacco beds. The sporangia, which may be entrapped by the glandular hairs on tobacco, are dependent for germination on the presence of abundant moisture. At 45° to 60° F. germination is accomplished in two

hours, at 70° in five hours, at 79° it does not take place, while at 82° the sporangia are killed in 42 hours and at 84° in 1 hour. Exposure for about an hour to direct sunlight is lethal in general; the sporangia are relatively short-lived except at low temperatures. A decisive influence on the course of downy mildew is exercised by meteorological conditions, the disease being arrested by clear days with temperatures of 84° upwards and promoted by rainy weather with overcast skies and temperatures between 50° and 60°.

The primary centres of infection by downy mildew in the early spring are seed-beds situated on or near the sites occupied by old beds, and the choice of fresh positions for new plantings is therefore one of the most important control measures [cf. ibid., xiii, p. 401]. Other sanitary practices calculated to reduce infection are indicated, including the application of nitrate of soda to the seedlings in the incipient stages of an attack in order to stimulate recovery.

VOLGUNOV (G. P.). **The development of micro-organisms on fermenting Tobacco.**—*State Inst. Tobacco Invest. U.S.S.R.*, 87, pp. 52–72, 1933. [Abs. in *Chem. Abstracts*, xxviii, 12, p. 3760, 1934.]

The influence of the composition of the medium, reaction, and oxygen tension on the development of fungi and other micro-organisms in the tobacco-fermenting process is discussed. Small quantities of formalin were found to stimulate fungal activity, which was totally inhibited, on the other hand, by a 75 per cent. carbon-dioxide content in the air chamber and partially suppressed by one of 50 per cent.

MCCALLUM (A. W.). **Check list of diseases of forest and shade trees.**—ex *Thirteenth Ann. Rept. Canadian Plant Disease Survey 1933*, pp. 76–92, 1934. [Mimeographed.]

A list (which is to be periodically revised) is given of the principal fungous diseases of trees in Canada, together with a number not yet definitely known but considered likely to occur in the country.

ALLAIN (A.). **La formation des œufs du Phytophthora cambivora en culture pure.** [The formation of oogonia by *Phytophthora cambivora* in pure culture.]—*Comptes rendus Soc. de Biol.*, cxv, 13, pp. 1521–1523, 3 figs., 1934.

Oogonia were produced in abundance by the agent of ink disease of chestnuts (*Phytophthora cambivora*) [*R.A.M.*, xiii, p. 336] at room temperature on Petri's synthetic medium [ibid., v, p. 681; vii, p. 366] with agar at various concentrations as well as on distilled water and agar (P_H 4·8 to 6·5). The minimum period required for oospore formation under these conditions was seven days. The cultures were obtained exclusively from mycelium grown on carrot agar for four to five days only before transference to the synthetic medium.

HORTON (G. S.) & HENDEE (CLARE). **A study of rot in Aspen in the Chippewa National Forest.**—*Journ. of Forestry*, xxxii, 4, pp. 493–494, 1934.

Two important rots of felled aspen (*Populus tremuloides*) were

found in a survey of one ¼-acre and four ⅛-acre plots in the Chippewa National Forest, Lake States, due to *Fomes igniarius* (with which the present study is mainly concerned) [*R.A.M.*, ix, p. 749 ; xiii, p. 338] and *F. applanatus* [*Ganoderma applanatum*].

Three stages of the white wood rot caused by *F. igniarius* were recognized, in the first of which the centre heartwood is only discoloured by streaky, black lines radiating out from the centre of the log. The second phase is marked by an extension of the lines and incipient breakdown of the wood at the centre. In the third and final stage the affected portion is completely collapsed, necessitating the full amount of deduction for defect in scaling for the entire area involved. The small, round, brownish fruiting bodies of the fungus usually begin to appear during the second phase of the rot, but only in the closing stage do they show 'annual rings'. From an examination of 108 cut trees it was ascertained that when only one small fruit body is present, the average extension of decay above it is 2 ft. and below 2·5, the corresponding figures for a large fructification being 2·8 and 5 ft., respectively. Where there are more than one small fruit body, the rot will extend roughly 3 ft. above and below them, the corresponding distances for several large fructifications being 5 and 5·5 ft., respectively.

The white butt rot caused by *G. applanatum* seldom extends up into the bole for more than 2 ft.

KOMAROV (F.). **Chemical composition of wood damaged by wood-destructive rots.**—*Bumazhn. Prom.* [*Paper Industry*], xiii, 2, pp. 49–60, 1934. [Abs. in *Chem. Abstracts*, xxviii, 11, p. 3553, 1934.]

An experimental study of the chemical properties of sound and rotted wood in relation to pulping and hydrolysis was carried out [in Russia] with 16 samples of living pine, spruce, aspen, and birch and some structural timber. The extractable matter was determined with hot water, ether, and 1 per cent. sodium hydroxide at 18° [C.], and the lignin, pentosan, cellulose, and ash contents of the extracted samples estimated. Hydrolysis was determined with 0·5 and 72 per cent. sulphuric acid and water absorption with sawdusts.

In all the samples, except one of aspen, the hygroscopicity of the sawdusts of rotted woods was 1 to 1·5 per cent. below the normal. Living wood in the second and third stages of white rot [*R.A.M.*, xii, p. 740] due to *Trametes pini* [ibid., xiii, p. 135] and *T. abietis* [ibid., vii, p. 813] show little change in the relative contents of cellulose and pentosans as compared with sound material, and can be utilized for pulping and hydrolysis. Pine attacked by the white rot *Polyporus destructor* [ibid., viii, p. 79] contains a higher percentage of cellulose than a normal tree (68 as against 52) and less lignin. The destructive brown rots of pine and spruce due to *Merulius lacrymans* and *Fomes pinicola* [ibid., xii, p. 261] cause a sharp decrease in the cellulose and pentosan content and an increase of lignin. Birch damaged by white rot is highly complex in chemical composition and unsuited for practical uses ; cellulose in this tree is decomposed both by *F. igniarius* [see preceding abstract] and *P. betulinus* [ibid., xi, p. 552]. The yields of

reducing sugars obtained by hydrolysis were found to be equal in sound and rotting wood, or even above the average in pine attacked by *P. destructor*.

BRAMBLE (W. C.). **Occurrence of the Strumella disease in the mid-west.**—*Journ. of Forestry*, xxxii, 5, p. 614, 1934.

Attention is drawn to the occurrence of large cankers and fruiting bodies of *Strumella corynoidea* [*R.A.M.*, xiii, p. 406] on red oak (*Quercus borealis maxima*) trunks in Rice County, Minnesota, a record lending additional support to the view that the disease is either native to North America or has been present in the country for a lengthy period.

SERVAZZI (O.). **Note riassuntive sui parassiti e la patologia di Pioppi.** [Summarized notes on the parasites and pathology of Poplars.]—*La Difesa delle Piante*, xi, 2, pp. 41–62, 1934.

A list is given of the species of fungi hitherto recorded in Europe, together with some from America, on Canadian poplar [*Populus canadensis*: *R.A.M.*, x, p. 417] and its closely related species, and notes are added on various diseases observed in Europe including those caused by *Rosellinia amphisphaerioides*, *Dothichiza populea* [ibid., xii, p. 127 ; xiii, p. 480], *Venturia tremulae* Aderh., *Phoma canadensis*, *Pholiota destruens*, and *Hypholoma fasciculare*; the paper concludes with a short account of bacterial canker [ibid., xiii, p. 408].

JØRGENSEN (C. A.). **Bøgens kimbladskimmel og dens Bekaempelse.** [The cotyledonary leaf fungus of the Beech and its control.]—*Dansk Skovforen. Tidsskr.*, *1934*, 4, pp. 123–127, 1934.

A popular note is given on the cotyledonary leaf fungus of beech seedlings (*Phytophthora fagi*) [*R.A.M.*, ii, p. 435 ; x, p. 755], which causes losses of up to 90 per cent. of the stand in Danish forest nurseries, and on its control by spraying twice with 2 per cent. Bordeaux or Burgundy mixture or dusting four times with Bordeaux dust.

LACHMUND (H. G.). **Growth and injurious effects of Cronartium ribicola cankers on Pinus monticola.**—*Journ. Agric. Res.*, xlviii, 6, pp. 475–503, 6 graphs, 1934.

This is a detailed account of the author's study during ten consecutive years of the seasonal growth of the cankers caused by blister rust (*Cronartium ribicola*) on the native western white pine (*Pinus monticola*) [*R.A.M.*, xiii, p. 339] in six different areas in south-western British Columbia, representing a variety of climatic conditions typical for the native range of the host. The results [shown in the form of tables and graphs] indicated that the size of the infected woody organ (twig, branch, or trunk) and the local ecological conditions were the main factors in determining the rate at which the cankers developed, while the vigour of the infected stem was of relatively slight importance, and that on the average

about 85 per cent. of the year's growth of the canker occurred during the active vegetative season of the host from spring to autumn. There was evidence that the longitudinal extension of the canker is directly related to the diameter of the infected stem. On the trunks which taper slowly, the downward spread of the cankers averaged nearly the same as the upward growth, while on the smaller, slower growing twigs which taper rapidly, the downward growth was over 30 per cent. greater than the upward. As a general rule, the curves for longitudinal growth rate over size of part infected were parabolic in form, rising steeply between stem diameters of 1 to 2 in., and tending to become almost horizontal at diameters over 5 in. Under optimum local conditions, the average annual downward growth of the cankers ranged from about 2 in. on the smallest twigs to about 5 in. on stems over 6 in. in diameter. Lateral or girdling growth was measured only on the larger stems, and was found to range from about 2·5 or 3 in. in areas of slower growth to about 3·5 in. in the optimum areas. On the smallest stems, girdling occurred within a few months during the growing season, and on the larger stems the average number of years required for girdling was about the same as the number of inches of stem diameter.

Death of a girdled stem down to the lower margin of the canker usually occurs in from one to four years following girdling, and if the canker is situated low enough on the stem or if the latter is in a weakened condition, the entire branch or trunk may die in that time; otherwise, the canker continues its downward spread with further die-back of the stem following irregularly behind it or even overtaking it, in which case the canker dies out before it can reach the main trunk. Such dying-out of the cankers is most frequent on the larger trees where the branches are longer, and the lower and inner portions of the crowns are under suppression. It was also found that most of the serious injury and killing of the trees results from girdling well down on the trunk by cankers which have spread down from the limbs.

The paper also contains a description of a method for the calculation of the time element and the determination of the manner of killing or injury by the cankers under determinable environmental conditions, illustrated by a few hypothetical cases.

ROHDE (T.). **'Zur Biologie der Douglasienschütte.'** ['On the biology of the leaf fall of Douglas Fir.']—*Zeitschr. für Forst u. Jagdwesen*, lxvi, 3, pp. 151–156, 1934.

The writer discusses Liese's hypothesis concerning the resistance to leaf fall (*Rhabdocline pseudotsugae*) of the so-called 'coastal' [green] forms of Douglas fir [*Pseudotsuga taxifolia*: *R.A.M.*, xii, p. 255; xiii, p. 482], and rejects the view that the absence of infection in stands of this type is a necessary concomitant of the late habit of growth. According to Liese, the main period of infection by the ascospores in north Germany is from 10th to 20th May, so that delayed needle formation automatically restricts the time of exposure to the attacks of the fungus. The writer, however, has obtained fresh ascospores more than a month later and

concludes that lateness of development alone is not a primary factor in producing immunity from leaf fall.

ROHDE (T.). **Kann man Rhabdocline pseudotsugae durch Aushieb vertilgen ?** [Can *Rhabdocline pseudotsugae* be eliminated by felling ?]—*Forstarchiv*, x, 8, pp. 121–123, 1934.

From accurate observations and consultation of the forest officers in 15 German silvicultural districts where all Douglas firs [*Pseudotsuga taxifolia*] infected by *Rhabdocline pseudotsugae* [see preceding abstract] were felled in 1932, the writer concludes that this method of combating the leaf fall disease is completely impracticable on a large scale.

LIESE (J.). **Absterben von Kiefernsämlingen durch Moniliopsis-Befall.** [The dying-off of Pine seedlings from *Moniliopsis* infection.]—*Forstarchiv*, x, 7, pp. 101–103, 3 figs., 1934.

Moniliopsis klebahni [*R.A.M.*, x, p. 294] was shown by inoculation experiments to be responsible for an extensive dying-off of pine seedlings in north German forest nurseries in May, 1933. Infection was contracted only by plants in moist soil with a plentiful admixture of humus.

OECHSLIN (M.). **Die Chrysomyxa rhododendri.** [*Chrysomyxa rhododendri.*]—*Schweiz. Zeitschr. für Forstwesen*, lxxxiv, pp. 1–5, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 3, pp. 62–63, 1934.]

Since 1932 spruces [*Picea excelsa*] in Switzerland have been severely attacked by the aecidial stage (*Aecidium abietinum*) of *Chrysomyxa rhododendri* [*R.A.M.*, xiii, p. 201] from an altitude of 1,250 m. to the limit of cultivation. In the late summer the spores of the rust are blown for miles by the wind in such profusion that they form, on germination, gelatinous masses on pools of water or snow. The mycelium appears to be capable of overwintering in the young needles. The red-coned spruce suffers more severely than the green-coned, especially in pure stands.

SIGGERS (P. V.). **Observations on the influence of fire on the brown-spot needle blight of longleaf Pine seedlings.**—*Journ. of Forestry*, xxxii, 5, pp. 556–562, 1 graph, 1934.

It has been experimentally demonstrated that the virulent brown spot needle blight (*Septoria acicola*) may seriously retard the growth rate of longleaf pine (*Pinus palustris*) seedlings in the southern United States [*R.A.M.*, xi, p. 813]. A single fire has been observed greatly to reduce the incidence of the disease in the first season, and often to a lesser extent in the second. Once the seedlings are established and before they emerge from the grass, controlled winter burning at three-season intervals, until a sufficient number of individuals start height growth, may be regarded as a useful silvicultural measure where the disease is injurious on areas of longleaf reproduction destined for growing timber.

HANSBROUGH (J. R.). **Occurrence and parasitism of Aleurodiscus amorphus in North America.**—*Journ. of Forestry*, xxxii, 4, pp. 452–458, 1 fig., 1934.

Lowland white firs (*Abies grandis*) in the Mount Hood National Forest, Oregon, were found in 1930 to be attacked by *Aleurodiscus amorphus* [*R.A.M.*, vii, p. 687], which formed narrowly elliptical cankers, with raised borders, up to 3 in. wide by 18 in. long, on stems ranging from ½ to 4 in. in diameter. Within the cankered area, the bark becomes cracked or occasionally shredded. The microscopic examination of sapwood underlying the diseased areas showed very slight penetration below the cambium by the mycelium. The centre of each canker was occupied by a dead branch stub, suggesting that the fungus develops saprophytically in the branch until entrance into the trunk is gained. This hypothesis is supported by the fact that the fruit bodies of *A. amorphus* are usually abundant on the dead branch stub, whereas no cankers have been found centred round a living lateral branch. Only one instance of branch infection by *A. amorphus* has come to the writer's notice, the host being the southern balsam fir (*Abies fraseri*) and the locality Massachusetts; otherwise the trunk appears to be the only part attacked.

In the spring of 1932 a tenth-acre plot was laid out in the above-mentioned heavy infection centre in the Mount Hood forest, in which 55 (46 per cent.) of the 119 lowland white firs showed the typical trunk cankers of the fungus, five being the maximum number on any one tree. Twelve of the diseased trees (22 per cent.) were dead. In the United States *Aleurodiscus amorphus* is known to occur on the following hosts besides those already reported: *Abies balsamea*, *A. amabilis*, *A. nobilis*, *Larix occidentalis*, *Picea mariana*, *P. engelmanni*, *P. sitchensis*, and *Pseudotsuga taxifolia*, the last-named and *Pinus strobus* being also attacked in Canada.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 1, pp. 13–14, 1934.

GERMANY (PROVINCE OF EAST PRUSSIA). As from 1st April, 1935, the cultivation of potato varieties not immune from wart disease [*Synchytrium endobioticum*] is prohibited in 14 localities of East Prussia [cf. *R.A.M.*, xiii, p. 544]. As regards the remainder of the Provinces arrangements for the application of this regulation will be made in due course.

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JORDAN (E.). **Zur Gemüsesamenbeizung.** [On vegetable seed disinfection.]—*Obst- und Gemüsebau*, lxxx, 4, pp. 54–55, 1934.

Referring to some recent work on the treatment of vegetable seeds against fungous diseases (which are estimated to be responsible for a reduction of 20 per cent. in the yield) [*R.A.M.*, xii, p. 264], the writer summarizes the results obtained by J. Steinberg at the Geisenheim (Rhine) Viticultural, Fruit Growing, and Horticultural College and Research Institute. Even at a strength as low as 0·125 per cent., liquid uspulun caused more or less severe injury to tomato, cucumber, melon, leek, lettuce, and bean seeds, whereas dusting with ceresan or tillantin R (up to 2 per cent.) proved entirely innocuous. A stimulatory effect was frequently observed, and the temporary set-back to the growth of certain head lettuce varieties, notably Maikönig, following dusting at 0·5 per cent., was more than compensated by the later luxuriant development of the plants. A number of diseases affecting seedlings in the propagation frame were partially or wholly controlled by dusting with these preparations.

CARTWRIGHT (K. St. G.) & FINDLAY (W. P. K.). **Studies in the physiology of wood-destroying fungi. II. Temperature and rate of growth.**—*Ann. of Botany*, xlviii, 190, pp. 481–495, 1 pl., 8 graphs, 1934.

A brief account is given of the results [presented in the form of tables and graphs] obtained by the authors in their study of the temperature relations for growth in pure culture on 2 per cent. Kepler's malt extract agar of 25 species or strains of wood-destroying Basidiomycetes of various origin. The results indicate that the data thus obtained are of value for the rapid differentiation of species, besides affording a useful means for indicating the possibility of any given species occurring in a certain locality or country, and for providing data as to the optimum conditions under which to carry out tests of the resistance of different species of wood to decay by a given fungus, or to test the toxicity of wood preservatives. Reference is also made to the relation between the temperatures suitable for growth and the thermal death point of the organisms.

Among other things the work showed that the variety *domesticus* Falck of *Merulius lacrymans* may be readily distinguished from the 'wild' *M. sylvester* [*R.A.M.*, xiii, p. 341] by the fact that, while both are very similar in culture, above 23° C. the growth of the former rapidly drops off, ceasing entirely at 25° to 27°, while

that of the latter continues to about 36°. This intolerance of high temperature is believed to be one of the reasons why *M. lacrymans* is rarely found in the open on timber exposed to sunlight and does not appear to have been recorded in the tropics. On the other hand, *Schizophyllum commune* [ibid., xiii, p. 186] was shown to be able to grow at surprisingly high temperatures, with an optimum between 30° and 35°, and a maximum at about 42° to 44°. The fungus is stated to be of common occurrence in the tropics and to have been isolated on several occasions from tropical timbers, e.g., *Shorea leprosula* and mahogany.

MEIER (DOROTHY). **A cytological study of the early infection stage of the black rot of Cabbage.**—*Bull. Torrey Bot. Club*, lxi, 4, pp. 173–190, 4 pl., 1934.

A detailed and fully illustrated account is given of the author's cytological investigation of the early stages of infection of cabbage (Danish Ball Head and Flat Dutch) and cauliflower (Best of All) with *Bacterium campestre* [*Pseudomonas campestris*: *R.A.M.*, xii, p. 425]. The results of artificial infection experiments in the greenhouse confirmed the view held by previous workers that infection can only occur under conditions of high atmospheric humidity, and is effected by the entry of the bacteria through the hydathodes present at the teeth of the leaves. The cytological study showed that the passage of the bacteria from the hydathodes to the tips of the tracheids is only possible in the presence of a continuous path of liquid between the two, the same condition being also necessary for the further movement of the organisms in the tissues of the epithem region. The entrance of the bacteria was also shown to be dependent on a combination of biological and mechanical factors, among which the recession movement of drops of water contaminated with the organisms from the hydathodes when transpiration is resumed is considered to be important, while the motility of the bacteria, diffusion, and convection currents in the drops may also influence entrance to a slight degree. The bacteria retain their motility inside the invaded tissue, and their multiplication appears to be in the direction of the food supply. Their passage between the cells is rendered possible by the fact that they secrete enzymes which dissolve the middle lamellae. It was finally shown that the organism causes invagination of the cell walls, disappearance of nucleoli, the collapse of nuclei and chloroplastids against the cell walls, and a decrease in the amount of cytoplasm of the cells which, however, were only rarely seen to be invaded by a few bacteria in the early stages of infection.

KAUFMANN (O.). **Die Verwendung von Bor zur Bekämpfung der Herz- und Trockenfäule der Rüben.** [The use of boron in the control of heart and dry rot of Beets.]—*Deutsche Zuckerind.*, lix, 15, pp. 305–306, 1934.

The results [which are discussed and tabulated] of experiments at Wernersdorf, Germany (on the soil used by Brandenburg for his trials with boron for the control of heart and dry rot of beets) definitely substantiated the efficacy of this treatment [*R.A.M.*, xii, p. 2; xiii, p. 72]. The highest increases of yield coupled with

the least disease were obtained by the application, just before planting, of 10 to 15 kg. boric acid or 15 to 20 kg. borax, both of which reduced the percentage of rotted beets from 69·5 to 1 or below, while augmenting the output by about 23 to 37 per cent. The cost of treating 1 hect. of beets ranges from about M. 5 to 7·50. Borax should be used in preference to boric acid for treatments after planting (up to 15th July).

BRANDES (E. W.) & COONS (G. H.). **Beet crop problems: science helps find the answers.**—*Facts about Sugar*, xxix, 3, pp. 83–85; 4, pp. 117–121, 1934.

After discussing the effect of sugar beet diseases upon yield in various parts of the United States since 1922, the authors describe the work done by the Division of Sugar Plant Investigation on sugar beet root rot and damping-off, associated with *Rhizoctonia* [*Corticium*] *solani*, *Phoma betae*, *Pythium* [*de Baryanum*], and *Aphanomyces* [*R.A.M.*, viii, p. 542], leaf spot (*Cercospora beticola*) [ibid., xiii, p. 415], and curly top [ibid., xiii, p. 285]. The paper concludes with an account of the results obtained in tests of promising strains, seed-production studies, and other agronomic investigations.

Rapport (1933) van de Commissie ter bevordering der Suikerbietenteelt te Groningen. [Report for 1933 of the Commission for the promotion of Sugar Beet cultivation at Groningen.]—*Meded. Inst. Suikerbietenteelt*, 3, pp. 23–72, 5 figs., 1934.

Three types of the yellowing disease of beets [*R.A.M.*, xiii, p. 10] are described on pp. 53–54 of this report. The first is a pronounced discoloration, chiefly of the apical parts of the oldest leaves, uniformly distributed throughout the field. The disturbance is most prevalent on sandy and light clay soils, and may be combated by heavy applications of nitrogen, with the absence of which it is evidently correlated.

Yellowing proper is not nearly so common as the foregoing, and its cause remains obscure. The condition may be observed at the end of July and beginning of August, and is characterized by yellowing of the older leaves with the exception of a green strip beside the veins. The affected foliage becomes brittle in contrast to the flaccidity of that affected by the preceding type.

A temporary mottling of the leaves in early July is also of uncertain origin.

SATTAR (A.). **A comparative study of the fungi associated with blight diseases of certain cultivated leguminous plants.**—*Trans. Brit. Mycol. Soc.*, xviii, 4, pp. 276–301, 2 figs., 3 graphs, 1934.

A detailed account is given of the author's investigation of the following fungi associated with diseases of cultivated leguminous plants, namely, a strain of *Ascochyta pisi* [*R.A.M.*, xii, p. 740] isolated from pea stem lesions in the Punjab, India, and two strains obtained from pea pod lesions in London and from stem lesions at Windsor, respectively; a weakly parasitic form of *A. pinodella* [ibid., xii, p. 609] from pea leaf lesions associated with *A. pisi* in the Punjab; two *Ascochyta* forms, considered to be varieties of

A. pisi, isolated from pod lesions of wild vetch (*Vicia sativa*) in England, and from pod lesions of lentils in the Punjab, respectively; a fungus from stem and pod lesions of gram (*Cicer arietinum*) in the Punjab; *Phyllosticta* [*A.*] *rabiei* [ibid., xiii, p. 346] from gram stem lesions from Spain; and two cultures each of *Mycosphaerella pinodes* [ibid., xii, p. 609] and *A. pinodella* obtained from the Centraalbureau voor Schimmelcultures in Baarn. Cultural studies and inoculation experiments in the greenhouse and in the field indicated that the English and Indian strains of *A. pisi* had the same host reactions, and that they are distinct from *M. pinodes* and *A. pinodella*, the only two species which were found to cause severe root rot; the Indian fungus from gram was found to be identical with *P. rabiei*, and finally the indications were that all the fungi studied, except *M. pinodes* and *A. pinodella*, are largely specialized each to its own host.

In dealing with the systematic position of *P. rabiei*, it is pointed out that it differs from *A. pisi* in having shorter spores (9 to 10 as against 12·5 to 13·5 μ), but that under conditions of high humidity and on plants at a certain stage of development, the spores of *P. rabiei* may reach the average size of those of *A. pisi*, the whole range of sizes varying from 6 to 15 by 3 to 6·5 μ in the Indian specimens and from 6 to 16 by 3 to 6·5 μ in the Spanish specimen studied by the author. As regards septation, all the fungi investigated fall into three classes: (1) with most of the spores one-septate, namely, the Indian and English strains of *A. pisi*, the two varieties from wild vetch and lentils, and the pycnidial stage of *M. pinodes*; (2) with one-septate spores present in fair numbers, but with a preponderance of non-septate spores, namely, *A. pinodella*; and (3) with one-septate spores practically absent, namely, the weakly parasitic form of *A. pinodella* from pea leaf lesions, and *P. rabiei*. The last-named fungus, in particular, whether growing on its host or in culture, generally shows a very small percentage (less than 2) of bicellular spores; actual counts made in India showed that under dry weather conditions the percentage of non-septate spores was 99·6, while under very moist conditions the percentage of bicellular spores was as high as 5. It was further shown that the Indian and Spanish strains of *P. rabiei* reacted differently at germination according to the medium, producing a high percentage of one-septate spores (90 and 83, respectively) only in acid media (N/25 malic acid). For all these reasons, and more especially because the spores of this fungus mostly become bicellular when taken from the host plant and germinated, the author upholds Labrousse's determination of this fungus as *Ascochyta rabiei* [ibid., xi, p. 344].

WENT (JOHANNA C.). **Fusarium-aantastingen van Erwten.** [*Fusarium* infections of Peas.]—Thesis [University of Utrecht (Hoeijenbos & Co., Utrecht)], 83 pp., 10 figs., 7 graphs, 1934. [English summary.]

A comprehensive, tabulated account is given of the writer's studies on the so-called 'St. John's disease' ('St. Johanniskrankheit') [*R.A.M.*, v, p. 530] of peas which causes heavy losses each year in Zeeland, the affected plants turning yellow and dying

prematurely. Van Hall, who investigated the disease during 1902–3, isolated from infected plants in Zeeland, Friesland, and Utrecht a fungus which he identified as *Fusarium vasinfectum* var. *pisi* (*Ber. Deutsch. Bot. Gesellsch.*, xxi, 1903). From the writer's experiments [full details of which are given] it would appear that the disease may be caused by several species of *Fusarium*, the most virulent symptoms being induced by *F. solani* var. *striatum*, *F. solani* var. *martii* [*R.A.M.*, xiii, p. 128], and *F. oxysporum*, while those due to *F. solani* var. *medium*, *F. equiseti*, *F. herbarum* [ibid., xii, pp. 278, 492], *F. herbarum* var. *viticola*, and *F. anguioides* [ibid., xi, p. 17] were less severe. The pathogenicity of the fungi was enhanced by copious watering of the plants shortly after inoculation. It is obvious, moreover, that the course of the disease is largely influenced by temperature, but the exact part played by this factor has yet to be determined. None of the five varieties tested showed an appreciable degree of resistance to *Fusarium* infection.

Inoculation experiments with *F. culmorum* resulted in an immediate wilting of the pea plants quite distinct from the gradual decline characteristic of 'St. John's disease', and evidently attributable rather to injury from the secretions of the fungus than to actual penetration by the latter. Confirmation of this view was obtained by placing cut and rooted plants in a filtrate of the organism from Richards's solution, under which conditions wilting and root rot take place within 24 hours. The fungus was recovered from the cortex of the tap-root and was also present to a small extent in the vascular bundles. The symptoms in one of the fields from which *F. culmorum* was isolated agreed with those induced by artificial inoculation, suggesting that this fungus is implicated in some measure in the wilting.

The various species of *Fusarium* associated with wilting effect their entrance into the plants in exactly the same way, although the resultant discoloration varies considerably according to the organism. The most rapid and conspicuous discoloration was produced by the relatively weak parasites *F. herbarum* and its var. *viticola*, followed by *F. solani* vars. *striatum* and *martii* and *F. culmorum*, while *F. oxysporum* and *F. equiseti* caused practically no darkening of the root system. Thus, a marked discoloration is not necessarily correlated with a high degree of toxicity. No trace of fungal development in the root cells was apparent at the first sign of discoloration, which is evidently an expression of host reaction to the secretions of the pathogen. The fungi under observation proved capable of penetrating into the root hairs and epidermal cells without wounding. Numerous protuberances are formed on the inner cell wall where the hyphae pass into the two cortical cell layers next to the outermost [cf. ibid., xi, p. 243]. In cases of advanced infection the mycelium spreads from the cortical cells into the vessels, principally by way of the bordered pits.

BREMER (H.). **Die Mehlkrankheit der Zwiebeln.** [The flour disease of Onions.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 4, pp. 37–38, 3 figs., 1934.

A brief, popular note is given on the so-called 'flour disease' of

onions due to *Sclerotium cepivorum* [*R.A.M.*, xiii, p. 558], which is stated to be widespread in Germany though apparently not hitherto reported from that country. No connexion could be traced between the sclerotia of *S. cepivorum* and those of a *Botrytis* commonly found on onion bulbs. The 'flour disease' is scarcely likely to assume epidemic proportions in Germany, where it may be expected, judging by its prevalence under the maritime climatic conditions of Great Britain, to occur mainly in damp summers. It may, however, prove to be a source of considerable loss and should be combated chiefly by a well-regulated rotation in which onions are excluded from infested fields for at least eight to ten years.

BREMER (H.) & NICOLAISEN (A.). **Die häufigsten Krankheiten und Schädlinge der Küchenzwiebeln.** [The most prevalent diseases and pests of kitchen Onions.]—*Biol. Reichsanst. für Land- und Forstw. Flugbl.* 130, 4 pp., 7 figs., 1934.

Popular notes are given on the symptoms, etiology, and control of some common diseases of onions in Germany, namely, *Tuburcinia cepulae* Liro [*Urocystis cepulae* Frost], causing a seedling blight and constantly reinfesting the soil by means of its innumerable minute, black spores from the leaves and scales; flour disease (*Sclerotium cepivorum*) [see preceding abstract]; downy mildew (*Peronospora schleideni*) [*R.A.M.*, xii, p. 484], frequently associated with the black spotting due to *Macrosporium parasiticum* [*Pleospora herbarum*: ibid., x, p. 219]; *Botrytis* rot; and slime ('Rotz') disease [ibid., xiii, p. 5].

ELSSMANN (E.). **Bekämpfung der Septoria-Blattfleckenkrankheit des Sellerie.** [The control of the *Septoria* leaf spot disease of Celery.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 4, pp. 192–205; 5, pp. 209–222, 1 fig., 1934.

A full account is given of three years' experiments (1930–2) at the Weihenstephan (Bavaria) Horticultural College and Research Institute in the control of celery leaf spot (*Septoria apii*) [*R.A.M.*, xii, p. 747 and next abstract] by the application of 1 per cent. Bordeaux mixture. The variety used in the tests was the Limburg celeriac.

Considerable benefit was derived from three or four applications of the fungicide both as regards elimination of infection and increase of yield, though the latter factor varied a great deal in the different years. In 1930, for instance, the yield of marketable celeriac was increased by 41·9 per cent. as a result of three treatments, in 1931 by 24·6 and 36·9 per cent. (three and four applications, respectively), and in 1932 by 57·2 and 114·8 per cent. (two and three, respectively). These discrepancies may be largely explained on a meteorological basis. In damp weather the plants, though extensively attacked by the fungus, generally remain fresh for a long time, whereas a dry, warm spell that checks the spread of infection may result in the rapid desiccation and death of the invaded leaves. Wacker's Bordeaux mixture [ibid., xiii, p. 449], though equally effective with the standard preparation as a fungicide, did not produce such heavy increases of yield as the latter. At a market price of M. 8 per cwt. the profit from spraying (three

applications) in 1931 was 13·9 and 22·3 per cent. for Wacker's and standard Bordeaux, respectively, while in 1932 the corresponding figures for two and three applications of the latter were 55·4 and 103·2 per cent., respectively.

SCHMIDT (E.). **Was können wir gegen die Blattkrankheit des Selleries tun?** [What can we do against the leaf disease of Celery?]—*Obst- und Gemüsebau*, lxxx, 5, p. 72, 1934.

In the Basel district of Switzerland the leaf blight of celery (*Septoria apii*) [see preceding abstract] may be prevented by seed disinfection with uspulun, tillantin dust, or copper sulphate (20 gm. per l. water); sprinkling the hotbed with 0·5 per cent. uspulun; regular crop rotation and plentiful manuring with potash, nitrogen to be sparingly applied; and repeated treatments of the stand with 1 to 2 per cent. Bordeaux mixture from June to August. Should infection develop in spite of all precautions, watering the plants from above should be discontinued and the water (mixed with potash or nitrophoska) carefully applied to the soil with a can or hose. If necessary two supplementary applications of 2 per cent. Bordeaux mixture at a 10- to 14-day interval may be given after the removal of the diseased leaves. Similar measures are effective against rust (*Puccinia apii*) [*R.A.M.*, xiii, p. 73].

CHU (V. M.). **Notes on the presence of Sclerotinia miyabeana in China, with special reference to the comparison of this fungus with Sclerotinia arachidis.**—*1932 Year Book Bureau of Entom.*, Hangchow, China, pp. 1–58, 8 pl., 1933. [Chinese summary. Received 1934.]

Stem rot of groundnuts in Japan is caused by two species of *Sclerotinia*, *S. miyabeana* and *S. arachidis*, described by Hanzawa in 1911. The principal morphological difference between these two species lies in the character of the sclerotia, which in *S. miyabeana* consist of a thick, dark brown rind and a colourless, loosely constructed medulla; they are readily detachable from the substratum, and present at maturity a hard, black, verrucose appearance. The sclerotia of *S. arachidis* are smooth, lustrous, finely punctate, composed of a colourless, compact medulla surrounded by a thin, brownish-black rind, and they are firmly attached to the substratum. The length ranges from under 1 mm. to over 1 cm. in both species. The asci of *S. miyabeana* measure 115 to 163 by 7·5 to 10 μ and the ascospores 10 to 14·2 by 4·5 to 7·5 μ, the corresponding dimensions for *S. arachidis* being 110 to 150 by 7 to 10 μ and 9 to 16 by 5·5 to 7·5 μ, respectively. The aerial mycelium of *S. miyabeana* is snow-white, of dense texture and irregular growth, contrasting with the whitish to greyish, loosely woven, and regular mycelium of *S. arachidis*. The conidiophores of the latter form a dense layer of the *Botrytis* type and may be from 450 μ to nearly 5 mm. high, the numerous pale sepia, ovoid or elliptical conidia being from 7 to 16 by 7 to 10 μ in diameter. Conidia were not observed in *S. miyabeana*, which produces ascocarps in much greater profusion than the other species and can also withstand a higher temperature (up to 33° as compared with 27° C.); a further means of separation is afforded by the colour of

the lesions on the host, those due to *S. miyabeana* being purplish brown to dark, eventually shade-brown and those of *S. arachidis* of a variable tinge of brown rapidly becoming black. A fungus destroying groundnut pods in Sanshi, north China, in 1929 was found to agree in all essential features with *S. miyabeana*.

Under dry conditions the mycelia of the two stem-rotting fungi may persist for at least eight months in the crop débris. All parts of the host may be attacked, the pods frequently containing sclerotia and the seeds being thinly coated with a velvety mycelial layer that develops abundantly in the presence of moisture. The optimum temperature for mycelial growth in both fungi is 20° to 25°. Spore infections by both fungi were found to occur solely through wounds, except on the flower petals, but the mycelium and germinating sclerotia are capable of invading uninjured tissues. Both species require plentiful moisture and a suitable temperature (19° to 25°) to cause infection; the incubation period varies from 36 hours to ten days with the method of inoculation, source of infection, and environmental conditions.

Other natural hosts of the two *Sclerotinia* species under observation include *Mazus japonica* [*M. rugosus*] and *Oxalis corniculata*; *S. arachidis* has further been found on celery, *Erigeron annuus*, *Panicum sanguinale* var. *ciliale*, and *Veronica polita* [*V. didyma*], while *S. miyabeana* occurs spontaneously on *Gnaphalium multiceps* [*G. luteo-album*] and radish. Inoculation experiments with both fungi were successful on lucerne (weak infection by *S. arachidis*), peas, clover (*Trifolium pratense* and *T. repens*), and broad beans, *S. arachidis* again being only feebly pathogenic on the last-named. Celery and eggplant reacted positively to inoculation by *S. arachidis* and *S. miyabeana*, respectively. In field trials, the Wensui variety from northern China proved the most susceptible among 27 tested to the attacks of both organisms; Lakuda and American from Japan remained immune from both; while Amoy and Unchow, from south China, were severely attacked by *S. arachidis*, but only mildly by *S. miyabeana*.

RANGHIANO (D.). **Recherches cytologiques sur le 'court-noué' de la Vigne.** [Cytological studies on 'court-noué' of the Vine.]—*Arch. Roum. Path. Expér. et Microbiol.*, vi, 4, pp. 353–495, 23 pl., 26 figs., 1933.

The writer has made a thorough study at the Montpellier Agricultural College, France, of court-noué of the vine, his thesis having been submitted to the Faculty of Sciences a fortnight before the publication of the paper by Viala and Marsais attributing the disease to *Pumilus medullae* [*R.A.M.*, xiii, p. 422].

The study of court-noué is stated to have occupied French and foreign scientists for about a century. Among the numerous synonyms applied to the disease [cf. ibid., xiii, p. 492] may be mentioned 'brûlure organique', 'carniure', 'gommose bacillaire', 'gélivure', and 'maladie de Californie' (*Plasmodiophora californica*: *Journ. de Bot.*, p. 378, 1892).

Generally speaking, the writer's comparative cytological examination of healthy and diseased Aramon, healthy Clinton, and diseased Taylor vine buds revealed no very striking discrepancies

between the two lots of material, apart from the deficiency or absence of starch and the cellular disorganization in the older tissues of the affected specimens. A more important feature of both healthy and diseased, European and American, vines is the presence in the roots (as already noted by Rives and others) of an abundant mycelium presenting all the characters of a mycorrhizal endophyte [ibid., iii, p. 500]. Rives, however, failed to trace the fungus beyond the endodermis, whereas in the present observations the mycelium was detected in the parenchyma of the vascular bundles and the medulla. In roots with the symptoms of court-noué, histocytological modifications are apparent, with abnormal, mitotic and amitotic nuclear division, frequent crushing of the cellular membrane, intensive plasmolysis of the cytoplasm, and sometimes hypertrophy of the cells, nuclei, and especially of the nucleoli. These changes are associated with an accumulation of hyphae, in the form of arbuscles, in the cells of the cortical parenchyma. In healthy vines these hyphae undergo extensive phagocytosis, whereas in the diseased tissues they extend down to (but not into) the xylem. In the stems of healthy vines hyphae have been found localized in the subepidermal, endodermal, and vascular regions of the shoots, while all the tissues and cells (again with the exception of the wood) are invaded in those of diseased plants. Similar conditions were observed in the leaves, flowers, seeds, and pips. In the shoots the filamentous form with hyphae 1·5 to 6 μ in diameter prevails, arbuscles, vesicles, and sporangioles being of rare occurrence. The Aramon variety appears to be specially susceptible to mycorrhizal invasion (as distinct from the normal symbiotic relationship), and its gradual disappearance, at any rate from the plains, is believed to be only a matter of time. The change from the symbiotic to the parasitic habit in the endophyte is accompanied by a fatty degeneration of the host tissues.

A bibliography of 87 titles is appended.

STUMMER (A.). **Eine seltene Rebkrankheit im mährischen Weinbaugebiete.** [A rare Vine disease in the Moravian viticultural region.]—*Das Weinland, 1933*, p. 15, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 3, p. 62, 1934.]

In 1931–2 vines at Irritz, south Moravia, were destructively attacked by *Cladosporium* [*Cercospora*] *roesleri* [*R.A.M.*, ix, p. 504], which produced a velvety, greenish-brown efflorescence, mostly on the under side of the leaves. From early July onwards the desiccation of the foliage progresses rapidly in an upward direction. No means of control are known.

ROSSI (A.). **Osservazioni sulle infezioni peronosporiche nel territorio di Parenzo nell' annata 1933.** [Observations on Vine mildew in the vicinity of Parenzo in the year 1933.]—*L'Istria Agric.*, N.S., xiv, 8, pp. 179–180, 1934.

In 1933, only late, relatively light outbreaks of vine mildew [*Plasmopara viticola*] occurred at Parenzo, Istria, but in parts of the neighbouring plains attacks developed on 4th May. Following a drop in temperature to between 5° and 8° C. on 16th–20th May attack was general on young leaves by 28th. In June infection was

arrested but was renewed in July following rains, the fruit clusters being affected. August was mainly fine and the last outbreaks, in September and October, were severe only on new leaves. Treatment consisting of three spray and four dust applications (about one-half the usual number) carried out in accordance with warnings issued [cf. *R.A.M.*, xii, p. 73] gave very satisfactory results.

VENKATARAYAN (S. V.). **Downy mildew of the Grape-Vine.**—*Mysore Agric. Calendar 1934*, pp. 52–53, 1 pl., 1934.

After a brief note on the symptoms of downy mildew of the vine [*Plasmopara viticola*: *R.A.M.*, xiii, p. 7] the author states that in Mysore the disease appears during the rains of the north-east monsoon, so that spraying should be effected during September–October. Three applications may be necessary, the cost of which (chemicals and labour) per plant amounts to only one anna [slightly over one penny] or less each application.

BITANCOURT (A. A.). **Relação das doenças e fungos parasitas observados na secção de fitopatologia durante os anos 1931 e 1932.** [Report on the diseases and parasitic fungi observed in the phytopathological section during the years 1931 and 1932.]—Reprinted from *Arq. Inst. Biol. Defesa Agric. e Animal*, v, 12 pp., 1934. [English abstract.]

A list is given of the fungous, bacterial, virus, and physiological diseases affecting citrus, banana, coffee, cotton, fruit and vegetable crops, ornamentals, and miscellaneous plants in São Paulo, Brazil, during 1931–2.

BOURIQUET (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Internat. Bull. of Plant Protect.*, viii, 5, pp. 99–100, 1934.

A supplementary list is given of diseases of parasitic, virus, or obscure origin, observed since October, 1924, affecting cultivated plants in Madagascar [cf. *R.A.M.*, x, p. 699], of which the following may be mentioned: *Corticium salmonicolor* on apple [ibid., x, p. 586]; *Phytophthora* (?) *jatrophae* [ibid., x, p. 755] on *Vanilla* [*planifolia*]; mosaic of sugar-cane; *Fusarium* wilt of rice; 'kroepoek' [leaf curl] of tobacco [ibid., xi, p. 478]; and *Bacterium solanacearum* on groundnuts [ibid., xi, p. 123 *et passim*].

ROGER (M.). **Le cancer chez les végétaux.** [Cancer in plants.]—*Bull. Assoc. Française pour l'Avancement des Sciences*, lxiii, 122, pp. 341–349, 1934.

In this paper a popular account is given of crown gall (*Bacterium tumefaciens*) with special reference to the parallel which has been suggested to exist between this disease and animal cancer [*R.A.M.*, xiii, p. 426].

GREANEY (F. J.). **Field experiments on the prevention of cereal rusts by sulphur dusting (1930–1932).**—*Scient. Agric.*, xiv, 9, pp. 496–511, 1 fig., 2 graphs, 1934. [French summary.]

The results of continued experiments from 1930 to 1932, inclusive, in Manitoba on the control of stem [black] and leaf

[brown] rusts of wheat (*Puccinia graminis* and *P. triticina*) and crown rust (*P. coronata avenae*) [*P. lolii*] and black rust of oats by dusting with sulphur [*R.A.M.*, vii, p. 565; xii, p. 504; xiii, p. 498] showed that all the rusts were almost completely checked in each of the years under survey by relatively light (30 lb. per acre) applications of sulphur dust, at intervals of five days spread over a dusting period of four or five weeks. This treatment significantly improved both yield and quality of the grain. In 1930, a severe rust year, the yield of Marquis wheat was increased by 24·3 bushels per acre or approximately by 400 per cent., while the quality (grade) of the grain was improved from 'feed' weighing 40 lbs. to '1 northern' weighing 60 lb. per bushel. In the same year the yield of Victory oats was increased by 45 bushels or about 153 per cent. per acre.

The best results were obtained with kolodust [ibid., xiii, p. 528], and in general it was noticed that the efficacy of the dust increased in proportion to the fineness of division, but very satisfactory results were also obtained with medium grades of sulphur.

RUDORF (W.) & JOB (MARIA). **Untersuchungen bezüglich der Spezialisierung von Puccinia graminis tritici, Puccinia triticina und Puccinia glumarum tritici, sowie über Resistenz und ihre Vererbung in verschiedenen Kreuzungen.** [Studies of specialization in *Puccinia graminis tritici*, *P. triticina*, and *P. glumarum tritici*, and of resistance and its inheritance in various crosses.]—*Zeitschr. für Züchtung*, A, xix, 3, pp. 333–365, 1934.

The authors state that under the conditions prevailing in the Argentine, wheat brown rust (*Puccinia triticina*) affects grain quality less than the black and yellow rusts (*Puccinia graminis tritici* and *P. glumarum tritici*), as it reduces the number of grains in the ear rather than their specific weight. Specialization studies [considerable details of which are given] of the black rust on Stakman's and Levine's differential wheat varieties [*R.A.M.*, xiii, p. 566] showed the prevalence in the different years of different physiologic forms of the rust, none of which could be identified with any other form so far found in America or Europe. The abundant occurrence in Argentina of barberry bushes, especially *Berberis buxifolia*, is considered to favour the production in nature of new physiologic forms of the rust. The results of tests for resistance of a number of wheat varieties agreed well with those obtained in North America; Hope, in particular, showed the same high resistance in an advanced stage of growth in the field, while exhibiting high susceptibility in the seedling stage in the greenhouse.

Tested on Mains's differential hosts [ibid., v, p. 477; xii, p. 151] brown rust spore collections from three different origins showed four different groups of physiologic forms, among which forms A and E appeared to be identical with Johnston's and Mains's forms 5 and 9. The varieties Riccio, Ardito, Fultz, and Chargorod proved to be resistant to this rust both in the greenhouse and in the field. The behaviour of Carina, Brevit, Webster, Mediterranean, Demokrat, and Kawvale varied from year to year,

according to which physiologic form predominated, but they appear to be resistant to many of the forms.

The varieties Chinese 165 and 166, Roter Sommerkolben, Heines Kolben, Garnet, and Golden Drop were shown to be resistant to yellow rust both in the greenhouse and in the field, while Mentana and Riccio were susceptible in the seedling stage but highly resistant in the field. Comparative inoculations on 11 differential wheat varieties with Argentine and European yellow rust inocula under controlled temperature conditions indicated that none of the 14 European biologic forms so far known [ibid., xii, pp. 272, 557; xiii, p. 567] occurs in the Argentine.

Studies on the inheritance of resistance to the three rusts indicated that while it is governed by Mendelian laws, no hard and fast rule could be determined as to whether resistance was dominant or recessive.

The climatic conditions at Santa Catalina, where the experiments were carried out, are so favourable for the development of the three rusts that it was possible in field tests to determine varietal reaction to all three. Several of the crosses that were studied gave promise of resistance to two or all three rusts, partly linked with resistance to loose smut (*Ustilago tritici*) and early maturity.

GARBOWSKI (L.) & JURASZKOWNA (Mme H.). **Essais d'identification des formes biologiques de la rouille Puccinia graminis tritici, provenant du territoire de Pologne. (Note préliminaire).** [An attempt at the identification of the biological forms of the rust *Puccinia graminis tritici*, originating from the territory of Poland. (Preliminary note).]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 45–55, 1 pl., 1934.

The year 1932 is stated to have been one of serious outbreaks in Poland, as well as in other countries to the south and south-east, of black rust of wheat (*Puccinia graminis tritici*) [*R.A.M.*, xii, p. 681] which hitherto had been considered of minor economic importance, in contradistinction to black rust of rye (*P. g. secalis*) which has rendered the cultivation of rye impossible in certain regions of Poland. There were indications that the wheat rust had been brought by air from outside the country, the intensity of the disease decreasing in districts to the north and north-west, though even there infection occasionally was as high as 80 to 100 per cent. The development of the rust was greatly favoured by adverse weather conditions during the preceding autumn and the early spring of 1932, which considerably retarded the normal growth of the wheat.

One of the outstanding features of the epidemic was that varieties which heretofore had been considered to be highly resistant to the rust, e.g., Pulawska Twarda, were severely attacked for the first time. Cross inoculations of the form isolated from the Pulawska Twarda variety and cultured on Stakman's and Levine's differential varieties [see preceding abstract] showed that except for some minor quantitative differences this form agreed with the American physiological form 40. The results of similar tests with a collection from the Podolanka variety in 1933 in Volhynia showed that it was identical with form 15. The fact

that no barberry bushes could be found in the vicinity of the infected wheat fields is considered to indicate that both forms 15 and 40 were introduced into Poland from outside.

WATERHOUSE (W. L.). **Australian rust studies. IV. Natural infection of Barberries by black stem rust in Australia.**—*Proc. Linn. Soc. New South Wales*, lix, 1–2, pp. 16–18, 1 pl., 1934.

A brief account is given of the first discovery in Australia in December, 1933, on barberry bushes growing under natural conditions at Yetholme, New South Wales, of spermogonia and aecidia of a rust which, when propagated and tested on Stakman's and Levine's differential wheat varieties [see preceding abstract], proved to be physiological form 34 of *Puccinia graminis tritici* [ibid., x, p. 367]. The same form was also found on *Agropyron scabrum* growing intermixed with the barberries, which were doubtless infected by the abundant teleutospores from the old stems of this grass. The rust was further found of *A. scabrum* growing at a considerable distance from the barberries.

Special importance is attached to this discovery, as it indicates the advisability of the eradication of all species of barberry susceptible to the rust, in view of the fact that form 34 is highly heterozygous and might easily give rise on this host to new physiological forms, a factor which would considerably complicate the problem of breeding wheat varieties resistant to black rust in Australia.

RUDORF (W.) & ROSENSTIEL (K. v.). **Untersuchungen über die Widerstandsfähigkeit bei Weizensorten gegen Weizenflugbrand, Ustilago tritici, und über ihre Vererbung in Kreuzungen.** [Studies on the resistance of Wheat varieties to loose smut, *Ustilago tritici*, and on its inheritance in crosses.] —*Zeitschr. für Züchtung*, A, xix, 3, pp. 324–332, 1934.

Out of a total of 86 [listed] varieties of wheat which were tested in 1930 and 1931 in La Plata [Argentina] for resistance to loose smut (*Ustilago tritici*), twenty-nine (including 38 M.A., Marquis, Garnet, Hope, and Hussar) were found to be completely immune from the disease. The fact that different physiologic forms of the smut could not be distinguished in artificial inoculations on several susceptible (e.g., San Martin, and Triunfo) and resistant (e.g., Duro Capa Klein, 38 M.A., and Chinese 466) wheat varieties with inocula of different geographical origins would suggest that the immune varieties tested are resistant to several forms, a fact which is of considerable importance for the production of immune varieties. The behaviour of the F_3 generation of a cross between the susceptible San Martin and the resistant 38 M.A., obtained from F_2 plants artificially inoculated in the ear, indicated that the resistance of 38 M.A. is probably dependent on three recessive factors. All the susceptible varieties tested, as well as the segregating lines of the above-named cross and of another one, showed a very high percentage of attack by the smut, a fact leaving little doubt that in those varieties in which the disease failed to develop resistance is inheritable.

TINGEY (D. C.) & TOLMAN (B.). **Inheritance of resistance to loose smut in certain Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 7, pp. 631–655, 3 figs., 1 graph, 1 map, 1934.

This is a detailed account of the authors' genetic studies [the results of which were checked by statistical methods] in Utah of the inheritance of resistance to loose smut (*Ustilago tritici*), character of awns, and colour of grain and chaff in the Hope C.I. 8178 × Federation, Hope × Dicklow No. 3, and Preston C.I. 3081 × 01–24 C.I. 11542 wheat crosses, in which Hope was shown in preliminary tests to be immune from the smut, 01–24 resistant, Dicklow No. 3 was possessed of a fair degree of resistance, and Federation was highly susceptible. The *U. tritici* inoculum used was obtained from the Dicklow variety in Utah, where it apparently occurs also on Federation and Sevier, and the pathogenicity of which gave indications in preliminary trials of being comparatively uniform. In the artificial inoculation experiments, maximum infection was obtained only when the smut spores were placed directly on the stigmas, and there appeared to be little or no difference in the amount of infection resulting from inoculations at the time when the stamens were rather green and immature or when the plants were in full bloom, and the pollen was being shed.

The statistical study of the behaviour of the F_3 generation of the various crosses indicated that at least three factors, R_1R_1, R_2R_2, and R_3R_3, were involved in the inheritance of resistance to loose smut, each of which is believed to have a different effect, an individual with the R_2R_2 factor showing somewhat more resistance than one with the R_3R_3 factor, and one with the R_1R_1 factor being about as resistant as one possessing the other two factors. It is pointed out that this does not mean that the factors have definite numerical values with specific expression, regardless of the genotype, as factor interaction is not an uncommon phenomenon. On this basis, Hope which was never smutted in spite of the large number of inoculated plants which were grown, is considered to be completely immune and to possess all three factors in the dominant condition, though dominance is evidently incomplete and the factors have a cumulative effect. Preston proved to be highly resistant and is assumed to possess the first two factors and to lack the third. 01–24 is assumed to possess the last two factors and to lack the first, while Dicklow No. 3 which was apparently more susceptible than 01–24 is assigned only the last factor R_3R_3, lacking the other two, and Federation is assumed to possess none of the factors for resistance.

There was no evidence in the studies of any relationship between the morphological characters of the varieties and their resistance to loose smut.

ANGELL (H. R.). **A preliminary note on the recognition of flag smut or bunt infection based on the deformation of seedlings.** —*Journ. Australian Council Sci. & Indus. Res.*, vii, 2, pp. 110–112, 2 pl., 1934.

A brief account is given of laboratory experiments at Canberra, Australia, the results of which showed that infection of young

wheat seedlings, at the moment when the majority of the coleoptiles are ruptured, with flag smut (*Urocystis tritici*) or bunt [*Tilletia caries* and *T. foetens*] can be recognized by the characteristic twisting and inclination of the infected seedlings in contrast to the almost invariably straight and erect habit of the controls under the environmental conditions described. These results are considered to offer an easy and time-saving method for a more accurate determination than hitherto possible of the total amount of infection with these diseases, and also for the differentiation in wheat varietal tests between resistance to infection and resistance to development of the disease. It is pointed out in passing that attack by species of *Fusarium* was much more apparent among the infected seedlings than among the controls.

GAUDINEAU (Mlle [M.]). **La carie du Blé en 1932–1933.** [Wheat bunt in 1932–1933.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 56–66, 1 graph, 1934.

Sowing experiments with the Bon Fermier and Florence 135 wheat varieties, conducted on the same lines as in previous years [*R.A.M.*, xii, p. 429], indicated that in 1932–3 the conditions for infection of the seedlings with bunt [*Tilletia caries*] were more favourable during the autumn than in the spring, a result which, taken in conjunction with previous ones, is considered to be typical for the vicinity of Paris. Further tests confirmed those of the preceding year [loc. cit.] in regard to the reaction of the various species and varieties of wheat which were tried, and also showed that the Swiss wheat Baulmes is resistant and that *Triticum dicoccoides* is susceptible to bunt under the local conditions. Differences in virulence were again found between bunt inocula of diverse origin, collections from Breslau and Cosel being the most virulent among those tested in 1933 [cf. ibid., xiii, p. 293].

Oversigt over Plantesygdomme. 197.—Vintermaanederne og April 1934. [Survey of plant diseases. 197.—Winter months and April, 1934.]—*Statens Plantepatol. Forsøg*, 5 pp., 1934.

O. Nielsen states that *Cercosporella herpotrichoides* was found in three places in Denmark in the early part of 1934, causing foot rot of wheat.

NISIKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Studies on a new Cephalosporium, which causes the stripe disease of Wheat.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 2, pp. 275–306, 7 pl., 1934.

A detailed, tabulated account is given of the writers' investigations on the so-called 'stripe' disease of wheat in the provinces of Okayama and Kagawa, western Japan, caused by a new species of *Cephalosporium*, *C. gramineum* Nisikado et Ikata, a complete technical description of which is given in English, supplemented by an abbreviated Latin diagnosis.

In the early stages (end of February or beginning of March) the *Cephalosporium* disease is reminiscent of the yellow type of wheat

mosaic [*R.A.M.*, x, p. 647]. About a month later the lesions assume an aspect resembling those of stripe disease (*Helminthosporium gramineum*) on barley. One or two, rarely up to four, continuous, yellowish-brown stripes are formed on the leaf blades, sheaths, and culms. By the end of May the symptoms are acute, and this phase is suggestive of take-all [*Ophiobolus graminis*], the affected plants being barely able to produce viable ears and showing a tendency to die off. The vascular bundles in the diseased areas turn yellowish-brown and the spiral and pitted vessels, in particular, contain numerous hyphae and conidia. The fungus overwinters chiefly on infected wheat straw and stubble, but is also perpetuated to some extent through contaminated soil and on seed. In addition to wheat, barley, wild oats (*Avena fatua*), and other Gramineae are affected by the disease and present in general similar symptoms, though the injury to barley is less severe. The mycelium of *C. gramineum* consists of tangled hyphae, 1·5 to 4 μ wide (average 2 μ); the simple conidiophores, 5 to 20 by 1·5 to 4 μ, bear at their apices capitate agglomerations of hyaline, long-elliptical to ovoid, continuous, usually biguttulate conidia, 5 to 10 by 1·5 to 3 μ. The fungus grows well on various standard media. The minimum, optimum, and maximum temperatures for growth are about 6°, 20° to 24°, and 29° to 30° C. Development occurs at a hydrogen-ion range from below P_H 4 to P_H 9.

Wheat seed-grain inoculated from cultures of *C. gramineum* germinated more slowly and in lesser percentage than the controls, the seedlings were stunted, root development impeded, and the characteristic leaf symptoms induced. The fungus was present in the leaf vessels and was successfully reisolated.

Control measures should include crop rotation, destruction of infected refuse, late sowing (after December), selection of resistant varieties, and possibly seed and soil disinfection, experiments in which are to be undertaken.

CROSIER (W.). **Abnormal germination in dusted Wheat.**—*Phytopath.*, xxiv, 5, pp. 544–547, 1 fig., 1934.

In July, 1932, a sample of Marquis wheat seed-grain treated with ceresan in March, 1931, and subsequently stored in a cool, dry place, gave abnormal results in laboratory germination tests, 13 per cent. developing short, thickened roots, 34 per cent. very misshapen plumules and roots, and 4 per cent. being dead. The injury is thought to have been accentuated either by the chipping or cracking of the seed coats, possibly during treatment, or by faulty storage conditions.

PAPE (H.). **Federbuschsporenkrankheit des Weizens.** [The plumed spore disease of Wheat.]—*Deutsche Landw. Presse*, lxi, 21, p. 255, 1 col. pl., 1934.

Semi-popular notes are given of the symptoms, etiology, and control of the plumed spore disease of wheat and rye in Germany caused by *Dilophospora alopecuri* [*R.A.M.*, viii, p. 300], the losses from which in the Rhine Province may amount to as much as 80 per cent. in individual stands.

BEVER (W. M.). **Effect of light on the development of the uredial stage of Puccinia glumarum.**—*Phytopath.*, xxiv, 5, pp. 507–516, 3 figs., 1934.

Within certain limits, various exposures to artificial light, supposedly comparable to different day lengths, induced little or no divergence in the expression of the infection type of *Puccinia glumarum* on Pannier, C.I. 1330 barley at temperature ranges of 45° to 50° and 55° to 60° F. [cf. *R.A.M.*, x, p. 714]. However, the six-hour day, compared with that of twelve hours, increased the incubation period by nine days. When the day length exceeded twelve hours there was a marked change of infection type from 4 (completely susceptible) to 0 (extremely resistant). A high light intensity (960 foot candles supplied by a 1,000-watt lamp) decreased the incubation period from 20 (ordinary daylight) to 11 days and promoted the subsequent development of the rust. A low light intensity (96 foot candles supplied by a 100-watt lamp) checked the full expression of the rust but failed to change the infection type, which was equally severe at all intensities. Uredospores produced under a low light intensity did not germinate in culture, but inoculation experiments with them gave positive results. At a temperature range of 68° to 70° F. the infection type was modified from 4 to 2 or 3 (moderately resistant or moderately susceptible), while above 80° no infection was secured.

MORWOOD (R. B.). **Covered smut of Barley.**—*Queensland Agric. Journ.*, xli, 3, pp. 236–240, 1934.

When barley seed affected with covered smut [*Ustilago hordei*: *R.A.M.*, xi, p. 505] was treated in Queensland in 1932 with formalin solution, tillantin R, and abavit B (2 oz. per bushel) the resultant infection when the crop was harvested was 0·2, 0·2, and 0 per cent., respectively, as compared with 7 per cent. in the untreated control plot. Laboratory examination showed that the formalin-treated seed deteriorated rapidly.

In 1933, single drill trials were made with various materials but the degree of infection was low. The results indicated that copper carbonate and tillantin R were only partially effective against *U. hordei* and that abavit B lost its efficiency when used at a lesser rate than 2 oz. per bushel. Formalin treatment (1 lb. to 30 galls.) did not reduce germination when the seed was planted in moist soil the following day.

Drill-sown plots were also laid down in 1933 with seed from a lightly smutted crop, cleaned and freed from smut balls and treated with copper sulphate solution (3 minutes in 1½ per cent.), abavit B (1 and 2 oz. per bushel), and formalin (10 minutes in 1 in 240). The amounts of infection that developed were, respectively, 0·23, 0·21, 0·02, and 0·02 per cent., as against 4·20 per cent. in the untreated controls.

Abavit B was easier to apply than formalin, had no detrimental effect on germination, could be applied at any time, enabled the treated seed to be stored indefinitely, avoided risk of recontamination by the fungus, and did not affect the rate at which the seed ran through the drill. The advantages of the formalin treatment

were that it was cheaper, and the treated seed was non-poisonous. Directions are given for applying both treatments.

PAPE (H.) & RADEMACHER (B.). **Erfahrungen über Befall und Schaden durch den Getreidemehltau (Erysiphe graminis D.C.) bei gleichzeitigem Anbau von Winter- und Sommergerste.** [Experimental observations on attack and damage by the cereal mildew (*Erysiphe graminis* D.C.) in the simultaneous cultivation of winter and summer Barley.]—*Angew. Bot.*, xvi, 3, pp. 225–250, 2 figs., 1 diag., 1 map, 1934.

During the past two decades the cultivation of winter barley has considerably extended in Germany, the area under this crop in 1932 being 245,809 hect. as compared with 47,025 in 1913. In Schleswig-Holstein the summer barley crops suffer very severe damage from mildew (*Erysiphe graminis*) [*R.A.M.*, xii, p. 620] in the vicinity of diseased winter ones, up to 100 per cent. infection having been observed as early as 5th May, 1933, at which time there was hardly a trace of infection left on the adjacent winter stands. The conidia are wind-borne, summer barley in the line of the prevailing winds from diseased winter fields being particularly liable to attack, especially when the latter are on higher ground. This may be checked by wind-breaks of quickset hedges between the winter and summer fields. As observed in pot experiments, early mildew infection on summer barley causes a marked reduction of the grain and straw yields (as much as one half, according to information from Denmark, where similar conditions obtain), defective grain development, pronounced retardation of tillering and maturity, enhanced tendency to lodging, and premature death of a large number of plants.

The winter barley may contract mildew from volunteer plants of the summer crop; hence the importance of early ploughing-under to remove this source of infection. As a rule the effects of early outbreaks of mildew on the winter stand are less severe than on summer barley, but the dead leaves of the former constitute a good breeding ground for *Cercosporella herpotrichoides*, an agent of cereal foot rot [ibid., xiii, p. 568].

Reports of mildew transmission from winter to summer barley have been received from certain mountainous districts in central Germany in which the climatic conditions approximate to those of the maritime area. According to Danish statements, wind-borne infection may occur up to a distance of 1,000 m., and the writers have found that an intervening space of at least several hundred metres is necessary to ensure protection. The practice of growing a mixed crop of oats and summer barley reduces the spread of infection in the latter. In a series of varietal tests near Kiel in 1932, none of the 84 summer barleys showed satisfactory resistance to mildew, all the central and north European strains contracting 90 to 100 per cent. infection and only two Japanese selections, Kobai and Nakano Vase, giving any indication of resistance (52·9 and 19·4 per cent., respectively). On the other hand, two of the 44 winter barley varieties tested in 1933, Blätterkinder and *Hordeum hexastichum pyramidum*, remained almost free from attack.

MEIMBERG (W.). **Ein Beizversuch zur Bekämpfung der Streifenkrankheit der Gerste.** [A disinfection experiment on the control of stripe disease of Barley.]—*Nachricht. über Schädlingsbekämpf.*, ix, 1, pp. 27–29, 1934. [English and French summaries on pp. 58, 60.]

Excellent control of stripe disease of barley [*Helminthosporium gramineum*], combined with a marked stimulatory action, was obtained in 1933 on an East Prussian agricultural station by seed treatment with the recently introduced ceresan liquid preparation U. 564 [*R.A.M.*, xii, p. 84] and ceresan dust, uspulun being somewhat less effective.

SHANDS (H. L.) & DICKSON (J. G.). **Variation in hyphal-tip cultures from conidia of Helminthosporium gramineum.**—*Phytopath.*, xxiv, 5, pp. 559–560, 1934.

Hyphal-tip cultures from the same germinating conidium of *Helminthosporium gramineum* from striped barley leaves reacted differently on potato-dextrose agar, in pathogenicity tests, and in the symptoms produced on barley plants, some being almost non-pathogenic in seed inoculations on the Wisconsin Pedigree 5–1 variety while others caused severe injury. Cultures from some spores showed less range of pathogenicity than others. The nature of the injury varied with the culture used, some inoculated plants developing typical leaf lesions, whereas others infected by cultures from the same spore were dwarfed and rosetted. It is evident, therefore, that a single conidium may carry within its cytoplasmic and nuclear composition factors producing more than one cultural and pathogenic type. Some of the cultures appeared more stable than others, both as regards pathogenicity and type of symptoms produced.

REED (G. M.). **Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion Oats.**—*Amer. Journ. of Botany*, xxi, 5, pp. 278–291, 1934.

This is a full report of the results obtained up to date in the author's studies of the inheritance of resistance to loose smut (*Ustilago avenae*) and covered smut (*U. levis*) [*U. kolleri*] in crosses between the highly resistant Black Mesdag oat and the varieties Hull-less, Silvermine, and Early Champion as parents highly susceptible to the Missouri races of both smuts [*R.A.M.*, xii, p. 562]. The three sets of hybrids showed a similar reaction to the two smuts, the results with the F_2 generations indicating that resistance is dominant and that segregation occurs on the basis of a 3 : 1 ratio. The results with the F_3 generations agreed well with the above data, but there were three types of F_3 progenies, depending on whether the F_2 plant had been inoculated with either one of the smuts or was uninoculated. In the first two groups, the F_3 progenies consisted approximately of one resistant to two segregating, while in the third group there were three classes of F_3 progenies, approximating to one resistant, two segregating, and one susceptible. Nearly all of the F_4 progenies were descended from resistant

F_3 families, and practically all of them were pure resistant and many as resistant as Black Mesdag. The marked parallelism in the inheritance of resistance to both smuts in the various F_3 progenies suggests that the same factor or closely linked factors are responsible for the resistance and susceptibility in these hybrids.

O'Brien (D. G.). **Die Streifenkrankheit bei Hafer.** [The stripe disease of Oats.]—*Nachricht. über Schädlingsbekämpf.*, ix, 1, pp. 1–27, 5 figs., 1934. [English and French summaries on pp. 57, 59.]

The writer's studies on the etiology and control of stripe disease of oats (*Helminthosporium avenae*) in Scotland, a detailed semi-popular account of which is given, have already been noticed from other sources [*R.A.M.*, xiii, p. 158].

Leach (J. G.). **The method of survival of bacteria in the puparia of the seed-corn maggot (Hylemyia cilicrura Rond.).**—*Zeitschr. für angew. Entomol.*, xx, 1, pp. 150–161, 9 figs., 1933. [Received July, 1934.]

This is a detailed and fully illustrated account of the author's histological investigation of the pupae in various stages of development of the seed corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) [*R.A.M.*, xi, p. 259] fed on decaying potato tubers. The bacteria originating from the latter were found to survive in the lumen of the mid-intestine (which is not shed during the moulting process), in the cast-out linings of the fore- and hind-intestine, and in the space between the pre-pupal cuticle and the true pupa. The bacteria surviving in the mid-intestine are reduced in number during the histolytic process inside the puparium, and appear to be subjected to some sort of selective action, so that only short rod-shaped species remain and begin to multiply rapidly before the imago emerges from the puparium.

While no attempt was made to identify the bacteria that survived in the mid-intestine, the fact that such organisms survive through the process of pupation and emerge in a viable condition in the body of the adult insect may be of far-reaching significance from the standpoint of the dissemination of soft rot plant pathogens, in the present case of the potato blackleg organism [*Bacillus phytophthorus*: loc. cit.], and requires further investigation.

Ojerholm (Elizabeth). **Multiciliate zoospores in Physoderma zeae-maydis.**—*Bull. Torrey Bot. Club*, lxi, 1, pp. 13–18, 1934.

The zoospores of the maize pathogen *Physoderma zeae-maydis* have been described as universally uniciliate but during a cytological study the author noted occasional biciliate and triciliate zoospores. The biciliate spores are about twice the size of the uniciliate ones and often contain two nuclei though sometimes only one. Fusion between the uniciliate spores has not been observed but one case of fusion between a uniciliate and a biciliate spore was noted, and there is an obvious possibility that the biciliate forms result from the fusion of sexual gametes. It may, however, be merely a case of incomplete separation of the spores.

The motility of the zoospores apparently lasts for several hours and may be marked by periods of amoeboid movements. The actively swimming forms are generally ellipsoidal and 5 to 7 by 3 to 4 μ in diameter.

TASUGI (H.). **On the life-history, pathogenicity and physiologic forms of Sclerospora graminicola (Sacc.) Schroet. (Studies on Nipponese Peronosporales III.)**—*Journ. Imper. Agric. Exper. Stat.*, Nishigahara, Tokyo, ii, 3, pp. 345–366, 1 graph, 1934. [Japanese, with English summary].

Continuing his studies on *Sclerospora graminicola* on *Setaria italica* and *S. viridis* in Japan [*R.A.M.*, xii, p. 623], the writer successfully inoculated both species with the oospores of the fungus by (*a*) smearing them directly on the seed, and (*b*) mixing them with the soil in which the seed was sown. Under natural conditions the oospores overwinter both on the seed and in the soil. Infection occurred on germinating seedlings transplanted on successive days into soil mixed with oospores up to only seven or eight days old, the percentage infected decreasing with age.

The plants naturally infected in the spring by the overwintered oospores may develop either yellowish-green stripes and abundant conidia on the leaves, or only oospores which form later in the season in the thick, yellowish-white, later brown, shredding foliage, and malformed ears.

Cross-inoculation experiments showed that the strain of *Sclerospora graminicola* from *Setaria italica* could infect an unnamed species (Sarukarazi) of *Setaria* but not *S. viridis*, while that from the latter was confined to its own host. Strains from two unnamed species infected each other but not *S. viridis* and only that from Sarukarazi infected *S. italica*. The conidiophores and conidia of all the strains were closely similar, while the differences between the dimensions of the oospores were also insufficient to justify the establishment of distinct species or even varieties. The oospores on *S. italica* are slightly smaller than those on *S. viridis*, those on one of the undetermined species (Sarukarazi) approximating to the former and those of the other (Karazi) to the latter. Morphologically all the strains may be considered to fall within the specific limits of *Sclerospora graminicola*, but on account of the slight divergences in the oospore dimensions and of the marked differences in pathogenicity it is well to distinguish them as physiologic forms I (*Setaria viridis* strain), II (Karazi strain), III (Sarukarazi strain), and IV (*S. italica* strain).

YU (T. F.), CHEN (H. K.), & HWANG (L.). **Seed treatment experiments for controlling kernel smut of Millet.**—*Nanking Coll. of Agric. & Forestry Bull.* (New Series) 14, 18 pp., 1 fig., 1 graph, 1934.

Millet [*Setaria italica*] kernel smut [*Ustilago crameri*: *R.A.M.*, x, p. 238; xii, p. 617] in China was controlled and yield increased by seed treatments with the following dusts used at the rate of 4 oz. per bushel of seed, copper sulphate, uspulun trockenbeize [ceresan: ibid., vi, p. 278; ix, p. 772], copper carbonate, tillantin

B, and tillantin trockenbeize, as well as by liquid treatment with formalin, uspulun nassbeize, tillantin nassbeize [uspulun-universal: loc. cit.], and tillantin B solution. In general, the dusts (of which uspulun trockenbeize and copper carbonate gave the best results) were less effective than the liquids. Soaking for two hours in formalin was slightly more effective than soaking for one hour. With uspulun nassbeize aud tillantin nassbeize soaking for either one or two hours gave practically identical results.

BITANCOURT (A.), DA FONSECA (J. P.), & AUTUORI (M.). **Manual de citricultura. II. Parte. Doenças, pragas e tratamentos.** [Manual of citriculture. Part II. Diseases, pests, and treatments.]—212 pp., 183 figs., São Paulo, Bibliotheca Agric. Popul. Brasil., 'Chacaras e Quintaes', 1933. [Received July, 1934.]

Notes are given in semi-popular terms on the symptoms, etiology, and control of the fungous, bacterial, and non-parasitic diseases and insect pests affecting the Brazilian citrus crop [cf. *R.A.M.*, x, p. 680].

BITANCOURT (A.) & GRILLO (H. V. S.). **A clorose zonada. Una nova doença dos Citrus.** [Zonate chlorosis. A new disease of Citrus.]—Reprinted from *Arq. Inst. Biol. Defesa Agric. e Animal*, v, 6 pp., 6 pl., 1934. [English abstract.]

Sweet orange (*Citrus sinensis*), lemon (*C. limonia*), and grapefruit (*C. paradisi*) [*C. decumana*] in São Paulo, Rio de Janeiro, and the Distrito Federal, Brazil, are affected by a previously unrecorded zonate chlorosis, the symptoms of which consist in alternating light and dark parallel zones or stripes on the leaves, arranged in elliptical rings or irregular lines symmetrically disposed round the midrib. The green fruits show annular or circular chlorotic areas, and the ripe ones dark brown, slightly depressed, irregular, sometimes ring- or arc-shaped markings. In orchards infested by the rust mite *Phyllocoptes oleivorus* (Ashm.) these dark brown markings generally develop round a previously formed spot which consists of concentric, fine, dark rings and is attributed to the mite. The cause of the disease, which presents some analogies to the concentric ring blotch of South Africa [*R.A.M.*, ix, pp. 450, 523], but differs in some essential features so considerably as to preclude any suggestion of their identity, has not yet been ascertained. Its characters suggest that it may very possibly be due to a virus infection.

BITANCOURT (A.). **A podridão do pé das Laranjeras.** [Foot rot of Oranges.]—Pamphlet issued by *Inst. Biol. Defesa Agric. e Animal, Div. Veg. Secç. de Phytopath.*, 12 pp., 5 figs., 1933. [Received July, 1934.]

A popular note is given on the symptoms, determining factors, prevention, and treatment of foot rot of oranges (*Phytophthora citrophthora* and *P. parasitica*) under Brazilian conditions [*R.A.M.*, viii, p. 378; xiii, p. 89].

SIRAG-EL-DIN (A.). **Citrus gummosis in Egypt.**—*Min. of Agric., Egypt, Tech. and Sci. Service (Mycol. Sect.) Bull.* 131, 44 pp., 6 col. pl., 23 figs., 3 graphs, 1934.

An account is given of the symptoms and distribution in Egypt of the citrus gummosis due to *Phytophthora citrophthora* [*R.A.M.*, x, pp. 308, 450, and preceding abstract], as well as of a comprehensive series of experiments in which positive results were obtained by inoculations with *P. citrophthora* of the trunks, roots, and fruits of numerous citrus varieties, the fungus being consistently reisolated from the diseased material. *Fusarium solani* [ibid., xi, p. 39], always associated with citrus gummosis in Egypt, favoured the extension of the disease, but no infection took place when inoculations were made with this organism alone. Observation and experiment showed that mandarin (*Citrus nobilis*) [var. *deliciosa*] and sour orange (*C. aurantium*) [var. *bigaradia*] are the most resistant to gummosis; then grapefruit (*C. maxima*) [*C. decumana* L.], rough lemon (*C. limonia*), and lime (*C. aurantifolia*); and then orange (*C. sinensis*) and sweet lemon (*C. limonia*). The Italian lemon (*C. limonia*) and citron (*C. medica*) are the most susceptible. The paper concludes with brief directions for prevention by improved orchard practices and control by the Californian method [ibid., xi, p. 779; xiii, p. 25].

FAHMY (T.). **Genetic basis of selection procedure with Cotton wilt disease.**—*Min. of Agric., Egypt, Tech. and Sci. Service (Mycol. Sect.) Bull.* 128, iv + 35 pp., 1934.

In continuation of his genetical studies of the inheritance in cotton crosses of resistance to wilt disease (*Fusarium vasinfectum* var. *aegyptiacum*), the author gives a detailed and tabulated account of his experiments to test the behaviour of the progenies of the phenotypic immune (i.e., behaving 'apparently' as immune in the absence of definite knowledge of their genetical composition), resistant, and susceptible descendants of such crosses [*R.A.M.*, xi, p. 178]. The results showed that the progenies of phenotypic immune plants descended from an immune by susceptible or an immune by heterozygous cross have in the F_3 generation totally immune or segregating families, the members of the former breeding true for immunity. In the F_4 generation, the phenotypically immune plants of segregating families give both totally immune and segregating families, the number of the former being proportionately larger than in the F_3 generation. In the F_2 and F_3 generations of an immune by heterozygous cross the percentage of phenotypic immunes was greater than in the corresponding generations of an immune by susceptible cross. By selection from successive generations of phenotypic immune plants originally derived from the heterozygous strain, Sakha 4, it was possible to increase the percentage of immunity until some of the families produced only totally immune plants in the fifth generation; the immunity of the sixth generation broke down, however, when tested in the greenhouse under conditions of exaggerated infection, but was well maintained under ordinary infected field conditions.

It was further found that the progenies of resistant plants always

segregate, the percentage of phenotypic immunes being, on the whole, larger among the descendants of an immune by heterozygous than of an immune by susceptible cross. The progenies of susceptibles do not in all cases breed true for total susceptibility but usually segregate, giving a very high percentage of susceptible and a very small percentage of resistant and sometimes even of phenotypic immune plants, indicating the persistence in them of an element of resistance.

From the practical standpoint, it is considered possible, by breeding successive generations of phenotypic immune plants descended from an immune by heterozygous cross, in which the heterozygous parent contains a high percentage of immunity, to arrive at the gradual elimination of the susceptible element, and thus to obtain a strain which will behave as totally immune on infected fields for successive generations.

FAHMY (T.). **The selection of wilt immune strains of long staple Cotton (Sakha 4 Gidid).**—*Min. of Agric., Egypt, Tech. and Sci. Service (Mycol. Sect.) Bull.* 130, vii + 25 pp., 5 pl., 56 diags., 1934.

This is a summarized account of the new method now in use in Egypt for the selection of cotton strains for immunity from the wilt disease [*Fusarium vasinfectum* var. *aegyptiacum*] and for commercial qualities of the lint, the first part of the work being based on the principles explained in a previous publication [see preceding abstract]. This is followed by the history of the selection of one of the five cotton strains which were retained at the end of the work, namely, Myco 19 (isolated from Sakha 4), which is completely immune from wilt under the worst conditions of field infection at Gemaiza, and which is now being propagated under the name Sakha 4 Gidid. This strain is stated to have a better yielding capacity than Sakha 4 and is equal to the latter in lint quality.

MILES (L. E.). **Verticillium wilt of Cotton in Greece.**—*Phytopath.*, xxiv, 5, pp. 558–559, 1934.

Information has been received from J. A. Sarejanni that the cotton wilt caused by *Verticillium albo-atrum*, previously recorded in the United States [*R.A.M.*, xii, p. 92], was observed in 1932 in Greece on crops grown from American seed and has since spread throughout the country. No evidence of the occurrence of the fungus within the cotton seed has been obtained but it is inferred, though actual proof is lacking, that the disease was introduced with seed from the United States. Cultures of the Greek *Verticillium* received at Mississippi proved to be identical with American isolations.

KING (C. J.), HOPE (C.), & EATON (E. D.). **Further observations on the natural distribution of the Cotton root-rot fungus.**—*Phytopath.*, xxiv, 5, pp. 551–553, 1 fig., 1934.

Cotton root-rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, pp. 92, 231] has recently been recognized in southern Utah, which may provisionally be considered the northern limit of the fungus,

while southward the disease extends into Sonora [Mexico] and Lower California. In 1933 the fungus was found on dying and dead Mexican poppy (*Argemone* sp.) plants a short distance south of the United States—Mexican boundary in a mountain wash draining through the Jacumba (California) settlement, where some lucerne fields were observed to be infested about a year earlier [ibid., xii, p. 516]. Under desert conditions the detection of the root-rot fungus is very difficult, being dependent on the casual discovery of a dead plant or of the rise of spore mats to the surface in wet weather. Early infestations in the Gila Valley are often traceable to diseased mesquite [*Prosopis juliflora*] roots or stumps or to the shrub *Lycium*. In addition to the native species already listed as root-rot carriers [ibid., xi, p. 370], the following were observed to bear the mycelium of the fungus in 1933: *Franseria confertiflora, Gutierrezia lucida, Platanus wrightii, Parkinsonia aculeata, Aster spinosus,* and *Cercidium torreyanum* [*P. torreyana*]. Evidence is adduced in support of the view that the movement of water in erosion and drainage from the higher elevations may play an important part in the infestation of the cultivated areas of the lowlands and deltas [loc. cit.].

EZEKIEL (W. N.), TAUBENHAUS (J. J.), & FUDGE (J. F.). **Nutritional requirements of the root-rot fungus, Phymatotrichum omnivorum.**—*Plant Physiol.*, ix, 2, pp. 187–216, 3 figs., 3 graphs, 1934.

This is a full account of the authors' studies of the nutritional requirements of *Phymatotrichum omnivorum* [a preliminary report of which has already been noticed: *R.A.M.*, x, p. 380]. In pure culture the fungus utilized the phosphate, magnesium, potassium, and probably also the sulphate mineral ions. Nitrogen was utilized equally well from organic sources (e.g., amino acids, peptone, and urea), inorganic ammonium, and nitrate salts. Ammonium nitrate was frequently the best source of nitrogen, a fact which is apparently in contradiction with the results obtained by Neal, Webster, and Gunn [ibid., xiii, p. 92], who, however, used ammonium nitrate and other nitrogen sources at concentrations found in these experiments to be too high for optimum growth. As sources of carbon the fungus utilized pentose and hexose monosaccharide sugars, disaccharide sugars, starch, and to a lesser degree mannitol. The best growth was produced in alkaline solutions; good development still occurred at P_H 3·7, but growth was inhibited at approximately P_H 3. There was no evidence that the fungus produced staling substances in the substrata after 33 days' growth.

The addition of small quantities of carrot juice to synthetic media resulted in a disproportionately large increase in growth of the fungus, but both of the vitamins A (from cod-liver oil) and B (from rice bran extract), at the concentrations used, were shown to be of little nutritive value to *P. omnivorum*. Sclerotia developed most abundantly in media best suited to rapid and abundant vegetative growth.

The variety of nutrient conditions found to be suitable for *P. omnivorum* agrees well with its wide host range, and also with

the fact previously established that the immunity of monocotyledonous plants is apparently determined by the presence in them of substances toxic to the fungus, rather than by any lack of nutrients.

NEAL (D. C.) & WESTER (R. E.). **An undescribed Sclerotium fungus prevalent in north-east Texas.**—*Phytopath.*, xxiv, 5, pp. 528–533, 4 figs., 1934.

Latin and English diagnoses are given of *Ozonium texanum* n. sp., found in 1932 on decayed cotton roots, stalks, and leaves just below soil level at Greenville, Texas. The fungus is characterized by a septate, sterile mycelium, at first white, later pale yellow or buff, and hyphae with opposite or alternate branches arising below the septa and growing in opposite directions or at an angle of 45° to the axis, with individual cells averaging 60 by 5·5 μ in diameter, forming plectenchymatic strands which enlarge into white to pale yellow sclerotia, 1 to 5 mm. long, of variable shape, usually ellipsoid or radiciform, constricted, often forked at the strand connexions, occasionally round or ovoid. The species differs from *Phymatotrichum omnivorum* in the finer texture of the strands, rapid formation of sclerotia on agar, apparent saprophytism, ease of culture, and in the absence of acicular hyphae and right angle branches.

PETCH (T.). **Entomogenous fungi from Madagascar.**—*Ann. de Cryptog. Exot.*, vi, 3–4, pp. 230–235, 1933. [Received July, 1934.]

The author gives a list, with annotations, of 15 species of entomogenous fungi collected in Madagascar by R. Decary. Three new species are described, with Latin diagnoses, namely, *Cordyceps cinnabarina* on a lepidopterous larva, *Clonostachys compacta* on a beetle, and *Spicaria* (*Isaria*) *rectangularis* on a lepidopterous pupa. *C. compacta* is characterized by hyaline, continuous, oblong or oblong-oval conidia measuring 5 to 6 by 2·5 to 3 μ, which adhere to one another obliquely, forming a vertical row in line with a phialide, while the rows from adjacent phialides cohere in regular columns up to 0·2 mm. high and 10 μ in diameter, resembling an ear of wheat. There is no central rachis and except for the arrangement of the conidia the fungus is a *Spicaria*. *Coremium pulcherrimum* is renamed *Spicaria* (*Isaria*) *pulchella* Petch, nom. nov.

BOCZKOWSKA (MARIE). **Quelques observations sur l'Isaria sp. parasite de Panolis flammea Schiff. en Pologne. (Note préliminaire.)** [Some observations on the species of *Isaria* parasitic on *Panolis flammea* Schiff. in Poland. (Preliminary note.)]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 67–74, 1934.

In this preliminary note the author records controlled experiments with a species of *Isaria* which was found parasitizing larvae and pupae of the Noctuid moth *Panolis flammea* [*R.A.M.*, vii, p. 321] in pine forests of Pomerania. In pure culture the fungus grew well at temperatures of 12·5° to 21° C., while lower temperatures down to 0° inhibited its growth but did not kill it. Light

did not appear to have any effect on the development and fructification of the organism, which grew equally well on and in forest soil containing from 25 to 100 per cent. of its water-holding capacity. Artificial infection experiments on pupae did not give conclusive results, as instars began the hatch out of the pupae on the second day following inoculation, but it was noted that a few of the hatched moths died inside the infection chamber, possibly from attack by the fungus, and were covered with coremia.

The spores and sclerotia of the fungus were found to remain viable in pure culture for at least six months, and when incubated, one-year-old mummies produced conidia; the same was also true of 15-month-old and desiccated cultures of the fungus on potato slants and on soil.

CIFERRI (R.) & REDAELLI (P.). **Phénomènes de conjugaison et d'endosporulation 'in vitro' du Coccidioides immitis Stiles.** [Phenomena of conjugation and endospore formation *in vitro* of *Coccidioides immitis* Stiles.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 5, pp. 141–145, 1934.

In cultures of *Coccidioides immitis* [*R.A.M.*, xiii, p. 579] reisolated from a granulomatous subcutaneous lesion in an inoculated guinea-pig, cell conjugation was observed for the first time, the endospore of two cells in close proximity swelling and buds being produced which united by means of a short conjugation bridge. The whole protoplasmic content passed from one gamete to the other, that of the smaller (when they were of different sizes) being absorbed by the larger. The resultant zygote appeared to have no visible character distinguishing it from the gametes.

The cells of *C. immitis* containing endospores are regarded as sporangia, and it is suggested that the zygote becomes transformed into a sporangium with aplanetic zoospores.

The authors' observations are considered to support their view that *C. immitis* should be placed among the Chytridiales in the family Coccidioidaceae Moore (1931) emend. Ciferri (1932).

SHREWSBURY (J. F. D.). **The genus Monilia.**—*Journ. of Path. & Bact.*, xxxviii, 3, pp. 313–354, 9 pl., 1934.

A comprehensive, tabulated account is given of the author's studies, extending over a three-year period at the University of Birmingham, on 19 strains of fungi commonly placed in the *Monilia* group, with regard to which great confusion exists owing to the different systematic criteria employed by botanical and medical mycologists. Four of these strains belong to the genus *Monilia* as understood by Persoon and were isolated by C. G. C. Chesters from brown rot of apple, pear, plum, and gooseberry, respectively, while the remainder are comprised either in the genus *Monilia* as understood by Castellani (not Persoon) or in allied genera of anascosporous, yeast-like fungi. These 15 strains do not form a homogeneous group. *M.* [*Candida*] *krusei* [*R.A.M.*, xiii, p. 511] is morphologically distinct from all the others and should not be included in Castellani's genus *Monilia*, approximating rather, in the writer's opinion, to a mycodermal yeast (near *Mycoderma cerevisiae*). The other 14 fall into four ill-defined groups,

viz., (1) *M. candida* [*C. vulgaris*] and *M. tropicalis*, (2) *M.* [*C.*] *albicans*, *M.* [*C.*] *psilosis*, *M.* [*C.*] *pinoyi*, P. J. Marett's fungus from pulmonary tuberculosis [ibid., xii, p. 692], an organism isolated by Mackey from a carcinoma of the lung, and five fungi obtained by the writer from human bronchi and other sites. All the fungi in this group are considered to be variants of the common *C. albicans*. (3) A fungus, believed to be an anascosporous yeast, isolated by the writer from a tuberculous sputum; and (4) two organisms, equally regarded as anascosporous yeasts, isolated by the writer, one from a tuberculous sputum and the other from a case of septic rhinitis. Omitting *M. krusei*, the only differentiation of the species of *Monilia* described by Castellani which the writer has found to be reliable, using the fermentation of sugars as a basis, is the separation of the first from the second of these groups by testing with sucrose, which *M. candida* and *M. tropicalis* ferment while the rest do not.

In the course of a discussion, based on exhaustive morphological, cultural, and biochemical researches on the groups under observation, the writer summarizes and criticizes the views set forth by Miss Berkhout [ibid., iii, p. 555], Henrici [ibid., x, p. 257], and Jacobson [ibid., xii, p. 217] regarding the generic limits of *Monilia* and some related genera.

MOORE (M.). **A new Geotrichum from a bronchial and pulmonary infection, Geotrichum versiforme Moore, n.sp.**—*Ann. Missouri Bot. Gard.*, xxi, 2, pp. 349–364, 1 pl., 1934.

From a case of bronchiectasis and pulmonary infiltration a *Geotrichum* was isolated which in hanging drop culture developed by the germination of an arthrospore into single or branched hyphae which at maturity formed thick-walled segments, breaking up into arthrospores by disarticulation. These at first are more or less rectangular but they become spheroidal, ovoid, or ellipsoid after separation, and measure 6 to 18 by 4 to 9 μ. Large terminal or intercalary chlamydospores are also formed, and measure up to 18 μ when spherical and 20 to 30 by 6 to 8 μ when elongated. Occasional small spherical cells (possibly blastospores), 4 to 6 μ in diameter, are formed laterally, and pyriform, conidium-like cells, 4 to 6 by 3 to 4 μ were also noted. The cultural, nutritional, and fermentative characters of the organism are described in detail. It is named *G. versiforme*, n. sp., with diagnoses in Latin and English, and there is a bibliography of 14 titles.

WILLIAMS (J. W.). **Scalp products and hair before puberty as culture medium for certain pathogenic fungi.**—*Proc. Soc. Exper. Biol. & Med.*, xxxi, 8, pp. 944–945, 1934.

Hair and scalp products of children under twelve, after or without extraction for 24 hours with ether, were placed in test tubes, moistened with distilled water, autoclaved, and used as a medium for a number of pathogenic fungi, parallel cultures of which on Sabouraud's agar were also made [cf. *R.A.M.*, xiii, p. 512]. With the exception of *Endomyces capsulatus* [ibid., xiii, p. 95], all the organisms grew on ether-extracted hair, while *Achorion schoenleini* was the only one that failed to develop on

untreated hair. The most profuse growth on extracted hair was made by *Glenospora gammeli, Indiella americana, Microsporon apiospermum, M. audouini, Monilia* [*Candida*] *albicans,* and *Trichophyton interdigitale* [*T. mentagrophytes*].

MOORE (M.). **Posadasia pyriformis and P. capsulata, two causative organisms of Darling's histoplasmosis in the United States.**—*Ann. Missouri Bot. Gard.*, xxi, 2, pp. 347–348, 1934.

Diagnoses are given in English and Latin of two fungal organisms, *Posadasia pyriformis* n. sp., and *P. capsulata* (Darling) Moore, n. comb. (syn. *Histoplasma capsulatum* Darling) associated with the human disease known as Darling's histoplasmosis, characterized by an acute specific infection usually affecting the epithelial and endothelial cells of the lungs, liver, and spleen. The organisms may also be present in a free state in these organs, as well as in the blood stream, reproduction in the host being by single yeast-like cells. In culture a mycelium, conidia, chlamydospores, and multispored asci are formed. Complete morphological, cultural, biochemical, and cytological details will be given in a subsequent paper.

SNYDER (A. J.). **Cause of yellow spots on canvas painted with chrome greens.**—*Indus. & Engin. Chem.*, xxvi, 5, pp. 579–580, 1934.

The author describes experiments showing that the yellow spotting often found on the chrome green painted stripes and other patterns on the cotton duck used for awnings and garden furniture in the United States is due, not to the moulds present in some of the samples [cf. *R.A.M.*, xi, p. 240], but to amine- or ammonia-forming bacteria which probably originate in the spinning and weaving rooms. The total nitrogen content of the canvas samples submitted by different manufacturers ranged from 0·16 to 0·23 per cent., and it is suggested that the spotting may be controlled either by eliminating this source of nutrition or adding an antiseptic to the cloth.

BEWLEY (W. F.) & ORCHARD (O. B.). **Rose diseases.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 45–47, 1934.

When a large number of diseased roses grown in glasshouses and the open in various parts of England were examined the commonest leaf disease was powdery mildew (*Sphaerotheca pannosa*) [*R.A.M.*, xii, pp. 642, 733] and the next commonest was rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xii, p. 175]. Where death was due to stem and root infection *Coniothyrium rosarum* [ibid., ix, p. 722] predominated and this fungus caused a striking amount of damage, though *C. fuckelii* [*Leptosphaeria coniothyrium*: ibid., xii, p. 633] and *Diaporthe umbrina* [ibid., xii, pp. 291, 696] also occurred. Considerable injury, especially to standard roses, was caused by *Botrytis* sp.

Of numerous fungicidal spray compounds tested in the dormant season none reduced or delayed the development of mildew and they probably had no effect on rust. The best results with

summer sprays against rust were obtained when certain copper compounds were carried in an emulsified oil.

WILLIAMS (P. H.). **Leafy gall of the Chrysanthemum.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933,* pp. 39–44, 1934.

In December, 1933, J. W. Streeter, Thanksgiving Pink, Crimson Conquest, December Bronze, and Cheshunt White chrysanthemums at Cheshunt Experiment Station showed, respectively, 57·9, 33·3, 30·2, 1·9, and 1·6 per cent. leafy gall, from which the organism resembling *Bacterium tumefaciens* was again isolated [*R.A.M.*, xii, p. 698]. There was some evidence that the addition of calcium sulphate to the soil reduced the disease, but the most promising method of control lies in the use of clean stock for propagating.

YOUNG (P. A.). **Stem canker of Hollyhock caused by Sclerotinia sclerotiorum.**—*Phytopath.*, xxiv, 5, pp. 538–543, 2 figs., 1934.

From 1931 to 1933 the writer investigated the stem canker of hollyhocks (*Althaea rosea*) in Montana caused by *Sclerotinia sclerotiorum.* Diseased plants develop white or light brown cankers, 5 to 45 cm. long and girdling the stem, which often bear sclerotia, white pustules, and brown arc-lines; retted bast fibres project from the lesions and sclerotia are found in the stems hollowed out by the fungus. Inoculation experiments with the fungus isolated from the hollyhock produced the typical symptoms on that host, while on White Beauty sunflowers (*Helianthus annuus*) it caused a characteristic and destructive wilt, destroying the plants within 60 days [*R.A.M.*, viii, p. 246 *et passim*]. *S. sclerotiorum* was reisolated from the infected hollyhock and sunflower stems. Apothecia and filiform bodies (representing an immature stage of the apothecium) were formed both in nature and in agar cultures. The morphological characters of the fungus are briefly described.

BURNETT (G.). **Stunt—a virosis of Delphinium.**—*Phytopath.*, xxiv, 5, pp. 467–481, 8 figs., 1934.

The symptoms of the virus disease known as 'stunt' or 'witches' broom' of delphiniums, which is common in Washington, Idaho, and other parts of the United States, have already been described [*R.A.M.*, vi, p. 18; xii, pp. 449, 473]. By mechanical means the virus has been transmitted to tobacco, tomato, cucumber, *Nicandra physaloides, Solanum nigrum,* prickly lettuce (*Lactuca scariola*), *Zinnia* sp., *Marrubium vulgare, Anthemis cotula, Capsella bursa-pastoris,* and *Petunia hybridum,* causing noticeable reactions of various types in all except the last three, which apparently carried the infective principle in a latent form, as determined by reinoculations into tobacco. Combined with tobacco mosaic, the delphinium virus intensifies the symptom expression of the tobacco mosaic on tobacco and causes on tomato variable manifestations, including filiform leaves and a type of streak [ibid., xiii, p. 192]; tomatoes inoculated with the delphinium virus and the potato latent virus developed spot necrosis and other symptoms not associated with either infective principle alone.

ROEDER (W. v.). **Wachstumsstörungen bei Kakteensämlingen.** [Growth disturbances among Cactus seedlings.]—*Kakteenkunde, 1934*, 5, pp. 88–90, 1 fig., 1934.

Attention is drawn to the occurrence among *Echinocactus myriostigma* seedlings in Germany of a growth failure due to the attack of an undetermined 'root-strangling' fungus which is prevalent in dense, ill-aerated plantings, in encrusted soils, and under other unfavourable conditions. Fungicides having proved useless against the trouble, the writer successfully treated the affected plants with a 1 in 1,000 solution of hakaphos, a stimulatory preparation containing 28 per cent. nitrogen. Some cultural directions are given for the elimination of the factors inducing poverty of growth and consequent fungal infection.

MCLAUGHLIN (ALICE M.). **A Fusarium disease of Cereus schottii.**—*Phytopath.*, xxiv, 5, pp. 495–506, 3 figs., 1934.

From a diseased cactus, *Cereus schottii*, in Mexico and Arizona the writer isolated a *Fusarium* closely allied to *F. oxysporum*, but differing from the latter in its smaller macroconidia, higher percentage of 4- and 5-septate spores, the absence or poor development of the spore foot, and in pathogenicity. The fungus is therefore tentatively classified as a variety of *F. oxysporum*. On inoculation with it *C. schottii* plants developed the typical vascular discoloration occurring in naturally infected individuals and from such experimental plants the fungus was reisolated. It appears to secrete a toxic substance affecting the living cells of the host beyond the actual range of the hyphae.

ERWIN (L. E.). **A grass destroying fungus new to America.**—*Forty-sixth Ann. Rept. Rhode Island State Coll. Agric. Exper. Stat.* (*Contrib.* 449), pp. 89–92, 1934.

In this paper (reprinted from *Bull. Rhode Island State Coll.*, xxix, 4, 1934) attention is drawn to the occurrence of *Corticium fuciforme* [*R.A.M.*, xi, p. 246, where it is spelt '*fusiforme*' in error] on Massachusetts and Rhode Island golf courses and polo grounds in 1932 and 1933. The fungus forms on bluegrass [*Poa pratensis*] and most species of bent [*Agrostis*] bright coral-pink, branched tufts, up to ¼ in. high, and furnished with an effused, mucous base. This appears to be the first record of the fungus [the taxonomic position of which is briefly summarized] in North America.

STREETS (R. B.). **The treatment of deciduous fruit trees and nut trees infected by Phymatotrichum omnivorum with ammonium compounds.**—*Science*, N.S., lxxix, 2053, pp. 417–418, 1934.

A preliminary note is given on the very promising result of experiments conducted in the Yuma Valley, Arizona, against root rot (*Phymatotrichum omnivorum*) of deciduous fruit trees, nuts, and ornamentals by fairly heavy applications of dilute solutions of ammonium sulphate or ammonium hydrate [*R.A.M.*, xi, p. 370]. Pecans [*Carya pecan*] responded particularly well to the treatment,

which cured all the trees in one of two trial orchards and effected a considerable improvement among those of the other.

MARSH (R. W.). **A summary of recent investigations on Apple scab.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 88–95, [1934].

In this paper, written in non-technical language and based on the more important recent papers on the subject, the author gives an account of various aspects of apple scab [*Venturia inaequalis*], the points dealt with including infections on the shoots, spread of infection in spring, times for spraying, spray damage, choice of fungicide, and suggested spraying programme for a group of six common commercial varieties of apple. A bibliography of 18 titles is appended.

BAINES (R. C.). **Control of Apple sooty blotch by May and June sprays.**—*Phytopath.*, xxiv, 5, pp. 553–555, 1934.

In sooty blotch [*Gloeodes pomigena*] control tests in 1928 one plot of Jonathan, Stayman, Grimes, and Rome Beauty apple trees at Lafayette, Indiana, was sprayed five times with liquid lime-sulphur and lead arsenate and lime (last two) and a similar plot given twelve treatments with colloidal sulphur-lead arsenate dust (85–15), the final spray being applied on 9th June and the last dust on 11th. The percentages of clean fruit on the sprayed and dusted plots were 87·3 and 67·3, respectively, while only 8·5 and 2·7 per cent., respectively, of the fruit on the untreated Jonathan and Rome Beauty trees was unaffected. In 1932, 99·5 per cent. of the fruit on a Rome Beauty tree sprayed four times with Bordeaux mixture was clean, the corresponding figures for two Staymans treated with flotation sulphur [*R.A.M.*, xiii, p. 310] and three of the same variety sprayed with ansul sulphur being 97·9 and 94·1, respectively; the Rome Beauty and Jonathan trees receiving only two early applications of 1 in 50 lime-sulphur yielded, respectively, 37·5 and 57 per cent. clean apples. From these data it is apparent that effective control of sooty blotch is given by fungicidal treatment just before the limited period of spore dissemination, which occurred in 1932 between the end of May and middle of June [ibid., xii, p. 298].

WALLACE (T.). **Some physiological disorders of fruit trees.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 322–333, 1934.

This is a briefly summarized review of the work done hitherto in the investigation of physiological troubles of fruit trees in various parts of the world, the results of which have shown that the most common causes of such disorders are deficiencies or excesses of nutrient elements, including unsuitable ratios of certain of these; unfavourable reaction of the soil; toxic concentrations of salts in the soil; unfavourable water relations in the soil; and unfavourable climatic factors. Each of these causes is concisely discussed, with an indication of the symptoms produced by it and of the measures used for its control. The paper terminates with a bibliography of 78 titles.

ROACH (W. A.). **Injection for the diagnosis and cure of physiological disorders of fruit trees.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 333–343, 8 diags., 1934.

In the introductory section to this paper the author briefly refers to the difficulty of application to large fruit trees of the water and sand culture methods for the investigation of physiological disorders due to deficiencies of nutrient elements, and also to the fact that the interpretation of the results of manurial experiments for the same purpose is complicated by base exchange and similar phenomena. For these reasons he suggests, as an additional method of study, the direct injection of suitable substances into the trees [cf. *R.A.M.*, ix, p. 501 ; xii, pp. 339, 602, *et passim*], which should merely supplement the normal supply from the soil and should not upset the dynamic equilibrium existing between the elements in the soil solution. He then describes methods for injecting whole trees, separate branches with or without their corresponding roots, or separate twigs. In terminating, he mentions some effects obtained by him from injections on the vigour of the tree and on disease.

CHAUDHURI (H.) & JOHAR (D. S.). **On Schizophyllum commune Fr., a parasite on trees in Lahore.**—*Journ. Indian Bot. Soc.*, xiii, 1, pp. 67–69, 1 pl., 1934.

Positive results are stated to have been obtained from inoculations made through wounds with pieces of the sporophore or with pure cultures of *Schizophyllum commune* [*R.A.M.*, xiii, p. 186] isolated from dead mango trees at Lahore, on *Dalbergia sissoo*, apple, *Acacia arabica*, apricot, mango, mulberry, and orange. Some six weeks after inoculation the affected tissues developed a brown discoloration, accompanied in the case of *A. arabica* by gum exudation ; numerous hyphae of the fungus were present in the wood.

WILSON (E. E.). **A bacterial canker of Pear trees new to California.**—*Phytopath.*, xxiv, 5, pp. 534–537, 1 fig., 1934.

Wilder, Easter Beurre, Winter Nelis, and Beurre Hardy pears and an unknown apple variety are liable in California to a bacterial canker contrasting in various respects with that due to *Bacillus amylovorus*. The periderm of the affected branches becomes loosened and raised, portions of it sloughing away to expose the spongy, disorganized, underlying cortex, which is light tan or buff in the case of active cankers, with brownish streaks extending upwards and downwards through the cortex and outer phloem for a distance of several inches beyond the visible lesion. During the summer the outer bark becomes longitudinally and transversely cracked as a result of the regenerative process below, while simultaneously the streaks at the apical margins of the cankers turn dark brown or almost black. The cankers are confined to the outer cortex and phloem, so that as a rule a long period is required for the disease to kill the trees ; in 1933, however, a number were destroyed in Placer County.

Unlike fireblight, the type of bacterial canker here described is active during the cooler months ; the cambium is not involved and

the loose, brownish cankers are quite distinct from the dark grey to black ones formed by *B. amylovorus*, in which, moreover, the periderm usually adheres firmly to the reddish-brown bark.

Isolations from the diseased tissues consistently yielded a bacterium capable of reproducing the symptoms of the disease on pear branches. It has not yet been thoroughly investigated, but has already been found to differ from *B. amylovorus* in cultural characters. A greenish pigment is formed on many media, suggesting a relationship with *Pseudomonas cerasi* [see next abstract] which was also indicated by the results of inoculation tests.

WILSON (E. E.). **Variability of Pseudomonas cerasi in physical characteristics of growth on solid media.**—*Phytopath.*, xxiv, 5, pp. 548–550, 1 fig., 1934.

Not only does *Pseudomonas cerasi*, the agent of a stone fruit canker in California [*R.A.M.*, xii, p. 455; xiii, p. 451, and preceding abstract], vary in pigment production in culture, but changes sometimes occur in the physical characteristics—elevation, topography, and consistency—of the colony. Thus, variants of the common flat, smooth, butyrous type have been isolated from the cankers in the form of raised, convolute, gelatinous colonies, the typical growth of which persisted on transference to potato dextrose agar slants for several months but eventually reverted to the normal. The gradual transformation of a flat, butyrous colony into a raised, gelatinous one was actually observed, and in plating-out tests the latter produced only gelatinous colonies whereas the normal flat areas gave rise to both types. A single-cell culture of *P. cerasi* changed from the butyrous to the gelatinous type and the variant was shown by inoculation experiments to be moderately pathogenic. The characters of the variant are considered to indicate a possible relationship between *P. cerasi* and *P. spongiosa* [*Bacillus spongiosus*: ibid., vii, p. 177].

OGILVIE (L.), SWARBRICK (T.), & THOMPSON (C. R.). **A note on a Strawberry disease resembling the American 'crinkle'.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 96–97, 3 pl. [1934].

A strawberry disease with symptoms identical with those of crinkle, as described by Zeller, in the United States [*R.A.M.*, xiii, p. 313], and differing from yellow edge [ibid., xii, p. 519] in the spotting and distortion of the leaves, has been observed by the authors in commercial strawberry plantations in south-western England for over five years. *Myzus fragaefolii*, the insect vector of crinkle in the United States, is stated to be thought to be identical with the common English aphis *Capitophorus fragariae*. Further investigations are in progress.

SIMMONDS (J. H.). **Bunchy top of the Banana and its control.**—*Queensland Agric. Journ.*, xli, 3, pp. 241–244, 3 figs., 1934.

After briefly describing the symptoms of bunchy top of bananas in Queensland [*R.A.M.*, xiii, p. 111] and discussing the nature and spread of the disease, the author states that control measures consist in the planting of disease-free suckers and the eradication of

diseased plants as soon as the symptoms appear. The Banana Industry Protection Board [ibid., ix, p. 607] is able to advise where planting material may be obtained. For the eradication of diseased plants the author recommends pouring at least half a pint of pure kerosene into the central leaf and allowing it to trickle down round the leaf bases so that the aphid vectors [*Pentalonia nigronervosa*] present may be killed; after a few hours the plants should be dug up and chopped into pieces. The plants associated with the affected one in the stool should be similarly kerosened and removed.

MAGEE (C. J.). **Squirter disease of Bananas.**—*Agric. Gaz. New South Wales*, xlv, 5, pp. 262–264, 1 fig., 1934.

A brief, popular account, based partly on the work of Simmonds and McLennan [*R.A.M.*, xiii, pp. 42, 43], is given of squirter disease (*Nigrospora sphaerica*) of bananas in Queensland, the chief points dealt with being its economic importance, symptoms, causal organism, seasonal nature, and control by improved packing and storing methods.

KESSELER (E. v.). **A preliminary study of varietal resistance in the Pineapple to the root rot fungus Nematosporangium rhizophthoron.**—*Amer. Journ. of Botany*, xxi, 5, pp. 251–260, 1934.

The work briefly described in this paper was carried out in 1932 at the Experiment Station of Honolulu, Hawaii, for the purpose of obtaining some preliminary information on the relative resistance of pineapple varieties and hybrids (thirteen of which were tested) to the root rot caused by *Nematosporangium* [or *Pythium*] *rhizophthoron* [*R.A.M.*, x, pp. 342, 740; xi, p. 129], and of developing a suitable technique for varietal tests. The degree of susceptibility of the hosts was measured by three different methods, namely: the rate of progress of rotting in very young root tips put into direct contact with pure cultures of the fungus in soil in observation boxes, during 48 hours after inoculation; the percentage of roots rotted in inoculated water cultures of single plants during a period of 21 to 31 days; and the retardation of host growth in artificially infected soil during a period of up to six months. While it is recognized that the first method takes into account only part of the possible factors in resistance, it proved to be sufficiently rapid and precise to give results of statistical significance, and was therefore used more extensively than the other two.

The results seemed to indicate the existence of definite differences in the susceptibility of the different varieties of pineapple to *N. rhizophthoron*, among which Cayenne proved most susceptible in the root inoculation but was somewhat variable in the water culture tests, while Wild Kailuga was second and third in order of susceptibility in these two series of tests, respectively. Pernambuco, Congo, and Ruby were fairly resistant in both series. The hybrid lot 520 was very high in resistance in the single root test, and Wild Brazil showed evidence of being even more resistant in the small number of tests made with it. In three hybrid varieties,

the parents of which were also tested, susceptibility was intermediate between that of the parent forms in the single root inoculation tests.

The results of the experiments made by the third method indicated that the soil type is of considerable importance for the pathogenic activity of *N. rhizophthoron*. In sterilized soil originating from a high rainfall region, where in the field it often shows considerable damage by Pythiaceous fungi, the Cayenne variety growing in artificially inoculated containers suffered a statistically significant retardation of growth as compared with the controls, while in similar tests of this variety in sterilized soil from a low rainfall region, where there is seldom much damage in the field, no appreciable differences were seen between the inoculated and control plants. Lot 520 and Pernambuco did not show any differences in weight increase during the period of the test in either type of soil, apparently because of the resistance of these two varieties to the disease.

HORSFALL (J. G.), NEWHALL (A. G.), & GUTERMAN (C. E. F.). **Dusting miscellaneous seeds with red copper oxide to combat damping-off.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 643, 39 pp., 4 figs., 3 graphs, 1934.

This is a summarized account of the results [given in two separate tables] obtained in continued greenhouse and field experiments on the efficacy of red [cuprous] oxide of copper [*R.A.M.*, xii, p. 232; xiii, pp. 5, 388] in the control of damping-off caused mainly by *Pythium ultimum*, and to a lesser degree by *Rhizoctonia* [*Corticium*] *solani*, of 107 species and varieties of ornamental and vegetable seedlings. Fifty-four of these (including beet, cabbage, carrot, cauliflower, cucumber, lettuce, melon, pea, spinach, and tomato) gave favourable results, but some cruciferous and leguminous plants showed a tendency to injury, and should be treated with caution. Onions, leeks, chives, and maize responded poorly or were injured. Injury to the plants appeared to be more likely to occur in the absence of organic matter or of sufficient moisture in the soil, and pre-soaking of certain seeds before dusting also appeared to favour injury. In small doses, the dust sometimes accelerated emergence and the elongation of the seedlings, and deepened the green colour of cucurbits, peas, tomatoes, and several others.

While most of the tests were made in soil naturally infected with *P. ultimum*, similar experiments in soil artificially infected with *C. solani* showed that this fungus may also be controlled by red oxide of copper, possibly on account of the cuprous ion.

The dose to be applied largely depends on the size and shape of the seed, varying from 0·25 to 0·50 per cent. by weight for cucurbits, peas, &c., to about 2·5 per cent. (1 level teaspoonful per pound) for the majority of the seeds, and 6 per cent. for beets. The seed should be shaken dry with the dust in a tight container until each seed is completely coated; they may then be held for any reasonable length of time in dry storage without injury. The dust should be bright, brick-red in colour, not darkening on standing, strongly adherent to white paper, and capable of passing through

a 325-mesh screen, leaving not more than 2·5 per cent. by weight of coarse particles.

BRANAS (J.) & DULAC (J.). **Nouvelle contribution à l'étude du mode d'action des bouillies cupriques.** [A new contribution to the study of the mode of action of copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 14, pp. 500–505, 1934.

Continuing their investigations of the factors governing the efficacy of copper compounds in the control of *Plasmopara viticola* [*R.A.M.*, xiii, p. 423], the writers conducted the following experiment. On a leaf of a vine were deposited a drop of water, particles of green malachite ($CuCO_3.CuO.H_2O$), and conidia of *P. viticola*, the whole being covered by a bell-jar. At the end of two hours, living zoospores were found to be present and a week later it was clear that infection had taken place. Similar results followed the substitution for green malachite of copper oxide or blue malachite ($CuCO_3.CuO.2H_2O$). On the other hand, no infection took place in the presence of blue malachite paste and the still more soluble tetracupric sulphate ($CuSO_4.3CuO.4H_2O$), or in that of 1 in 500,000 copper sulphate. Further proof is thus afforded of the importance of solubility in determining the efficacy of copper mixtures against vine mildew. The quantity of washed precipitate necessary for the protection of the foliage varies with the hydrogen-ion concentration of the rain water, diminishing in proportion to the fall of the latter—a natural consequence of the solvent action of acidity. In 1933 the high acidity of the autumn rains in France explains the observations of L. Ravaz as to the efficacy at this period of treatments applied several months previously. No support is stated to be forthcoming for the view that contact is necessary for the fungicidal action of the spray deposit. [This paper is reprinted in *Prog. Agric. et Vitic.*, ci, 21, pp. 494–496, 1934.]

PASTAC (I.). **La constitution des phénols et leur action anticryptogamique.** [The constitution of phenols and their anticryptogamic action.]—*Chimie et Indus.*, xxxi, 4 *bis*, pp. 1027–1032, 1934.

The fungicidal action of the phenols was shown by the writer's laboratory experiments to be closely related to their chemical constitution, while the number of radicals and their position in the nucleus exercises a direct influence on the fungicidal value of the molecule. Pyrocatechin (orthodioxybenzene) was found to be more active than resorcin (metadioxybenzene) [*R.A.M.*, xiii, p. 164], toxicity being correlated with the instability of the former product (the radicals of which occupy an abnormal position). Similarly, pyrogallol (1–2–3–trioxybenzene, abnormal isomer) is a more powerful fungicide than phloroglucin (1–3–5–trioxybenzene, normal isomer). The naphthols are more active than the phenols, the anticryptogamic effects of which may be augmented, however, by chloruration, nitrozation, and nitration, whereas they are almost completely counteracted by sulphonation.

SORAUER (P.). **Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären- und Virus-Krankheiten. Zweiter Teil. Sechste, neubearbeitete Auflage.** [Handbook of plant diseases. Volume I. The non-parasitic and virus diseases. Part II. Sixth revised edition.]—viii + 553 pp., 129 figs., 11 diags., 7 graphs, Berlin, P. Parey, 1934.

In this part of the sixth revised edition of Sorauer's 'Handbook of Plant Diseases', issued under the supervision of Dr. O. Appel and his collaborators [*R.A.M.*, xiii, p. 114], the following aspects of phytopathology are considered: plant diseases caused by internal factors (K. O. Müller); unfavourable physical and chemical soil conditions as a cause of plant diseases (E. Pfeil); wounds inflicted by meteorological, human, and animal agencies, the reaction of plants to wounding and its effect on their general development, and the regenerative processes (O. Schlumberger); smoke and effluent injuries (E. Tiegs); and virus diseases, comprising a general section on etiology, symptoms, behaviour of the virus in the plant and *in vitro*, course of the disease in relation to external factors, manifestations of resistance, classification, and control, and a special section dealing with virus diseases (a) of Solanaceae and (b) of non-Solanaceous crops arranged by the crop (E. Köhler). The high standard of the previous part of this great work is well maintained.

COTTAM (C.). **Eelgrass disappearance has serious effects on waterfowl and industry.**—*Yearbook of Agric., 1934, U.S. Dept. of Agric.*, pp. 191–193, 1 fig., 1934.

The author states that one of the outstanding biological phenomena of recent times has been the sudden and nearly complete disappearance during the past two or three years of eelgrass (*Zostera marina*) [*R.A.M.*, xiii, p. 529] along the Atlantic coasts of North America and Europe. By far the greatest biological importance of this seaweed is the fact that normally it forms the staple winter food (over 80 per cent.) of sea brant geese and is an important food of several other species of waterfowl, the continued existence of which is seriously threatened by its disappearance; the latter is also affecting the fishery and shell-fishery industries, and has caused considerable erosion of many coastal areas.

Brief reference is also made to the many economic uses to which eelgrass has been put in Europe and North America, ranging from its employment as fuel, fertilizer, bedding material for man and cattle and the like, to its use in modern times for heat and sound insulating purposes in buildings. To illustrate the commercial importance of eelgrass, it is stated that in 1929 (probably the year of maximum production) two Boston firms alone imported 1,725 tons of the dried plant from Nova Scotia, and that in the past the exports from the Netherlands amounted to 2,000 to 3,000 tons annually. The price paid in the United States for the dried material delivered at the factory varied from $20 to $30 per ton.

While the factor or factors responsible for the destruction of eelgrass plants may have been operating unnoticed for a long period, the disease spread with a rapidity and sudden destructiveness hitherto unrecorded in botanical history. The first signs appeared

in midsummer of 1931 in most localities from North Carolina to New England and, before the summer was over, less than one per cent. of a normal stand of the plant remained intact in the sections affected. The leaves broke from their roots and washed ashore in great windrows. While it is not possible to foretell whether the plant will return in these areas to its normal abundance, in some places a progressive improvement has been noted since the first widespread destruction, particularly in the southern part of the eel-grass range along the North American coast. All available information indicates that, though there have been periods of scarcity in the past, none in the memory of man has been at all comparable with the present one. Though the cause of the disaster is not positively known, evidence is said to point strongly to a bacterial infection.

MacClement (D.). **Purification of plant viruses.**—*Nature*, cxxxiii, 3368, p. 760, 1934.

The following method, adapted from one used by Warburg and Christian for the purification of a water-soluble ferment (*Biochem. Zeitschr.*, ccliv, p. 440, 1932), has proved effective in the preparation of a purified suspension of any of the 'X' group of plant viruses [*R.A.M.*, xiii, p. 462]. Starting with volume *V* of extracted juice: (1) *V* is cooled to 0° C. and diluted to 15 *V* with water at 0°. Carbon dioxide is passed through the mixture at 0° for 30 minutes. This mixture is then centrifuged rapidly until a clear, straw-coloured supernatant is obtained (about 15 minutes at 3,000 r.p.m.). The precipitate, containing about one-third of the original solids, is discarded. (2) The supernatant is diluted to 200 *V* with water at 35° C., at which temperature carbon dioxide is passed for 15 minutes through the mixture; this is centrifuged for about one hour at 2,000 r.p.m. and the supernatant discarded. (3) The precipitate is suspended in *V* c.c. distilled water and centrifuged for about 15 minutes at 3,000 r.p.m., after which the precipitate is discarded. The supernatant, containing most of the virus and practically no protein, is faintly opalescent but colourless. In (1) the flask is immersed in a freezing mixture. In (2) the cautious use of a micro-burner will keep the temperature within half a degree of the optimum while the length of the period of centrifuging required to bring down the precipitate may be curtailed to 30 minutes or less by the use of higher speeds, as well as by adding a trace of aluminium sulphate or leaving the mixture in the cold overnight.

With virus 'X' from diseased tobacco plants, a final suspension can be produced by this method that will infect three out of five *Nicotiana glutinosa* plants at a dilution of 1/50,000 as compared with four out of five with crude sap at the same dilution.

Ainsworth (G. C.). **Virus disease investigations.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 54–64, 3 figs., 1934.

In 1933, spotted wilt [*R.A.M.*, xii, p. 730; xiii, p. 333] was less common in large tomato nurseries in Great Britain than in mixed

nurseries and gardens where other crops were also grown. Affected plants should be rogued out at once and the insect vector (*Thrips tabaci*) destroyed. *Primula sinensis*, *P. malacoides*, and *Gloxinia* were noted as new hosts.

Aucuba mosaic of cucumbers [ibid., ii, p. 491] was not observed for three years at Cheshunt, where ordinary or mild mosaic (synonyms, 'green cucumber mosaic' and 'cucumber mosaic') due to cucumber virus 3 [ibid., ix, p. 21; x, p. 60] predominates, and a third type with a wider host range, considered by Bewley to be distinct from aucuba, has appeared. When melons, gherkins, and *Cucumis maderaspatanus* were artificially inoculated with cucumber virus 3 a green mottle of varying intensity developed, accompanied by leaf distortion and stunting, but vegetable marrow and *Bryonia dioica* were not affected, all attempts to infect Solanaceous plants also giving negative results. Yellow cucumber mosaic (synonyms, 'cucumber mosaic' and 'white pickle' mosaic) [ibid., xi, p. 349; xii, p. 108] is more frequently present on vegetable marrow than on cucumber; it was also found occurring naturally on tomato, gherkin, *B. alba*, *Hyoscyamus* sp., and *Datura stramonium*. This virus (cucumber virus 1) was filterable through Pasteur-Chamberland filters; it was not very resistant to ageing *in vitro* (three days), heat, or chemicals. Tomato is rather easily infected, but the symptoms vary considerably. A very mild mottle without distortion or with slight narrowing of the leaves is common, but occasionally the severe 'fern leaf' type of distortion [ibid., ix, p. 417] is present. Melon, *B. dioica*, tobacco, and some other Solanaceous plants are susceptible. The use of clean seed greatly reduced the incidence of the disease.

When seed collected from tomatoes affected with glasshouse streak [ibid., xiii, p. 192] was tested for the presence of the virus it was found in the seed coats. The evidence showed that the virus is not carried over in the embryo but that the seedlings may become infected from the seed coats. The recommendation to save seed only from healthy plants therefore holds good for streak as well as aucuba mosaic of tomato [ibid., ix, p. 735].

KUNKEL (L. O.). **Studies on acquired immunity with Tobacco and Aucuba mosaics.**—*Phytopath.*, xxiv, 5, pp. 437–466, 7 figs., 1934.

In these studies except where otherwise stated the method of inoculation was by rubbing the leaves with a glass spatula covered with cheese cloth and moistened with juice from diseased plants of *Nicotiana tabacum*. The tomato aucuba mosaic originated from Rothamsted and the tobacco mosaic (Johnson No. 1) from Johnson himself. Tomato aucuba mosaic becomes systemic in tobacco (*Nicotiana sylvestris*) instead of forming necrotic lesions, if the plants are held at a temperature of 35° C. for three days, but if the plants are removed to greenhouses with a temperature too low to initiate systemic infection, the latter form of the disease persists. Various strains of aucuba mosaic have been obtained by varying the period of incubation at high temperatures but all are less severe than normal aucuba and are regarded as attenuated strains.

Cross-immunity studies have shown that plants infected by

attenuated strains of the tomato aucuba mosaic virus acquire immunity from the unattenuated virus [*R.A.M.*, xiii, p. 400]. Plants infected by the tobacco mosaic virus become immune from aucuba mosaic, except in the youngest leaves. Mature leaves of healthy plants heavily inoculated with tobacco mosaic acquire immunity from aucuba mosaic in the parts inoculated. Immunity resulting from systemic infection is closely associated with the invasion of the tissues by the mosaic virus and develops more slowly than that consequent on direct inoculation, which is manifested within two days.

There is little or no multiplication of the aucuba mosaic virus in tobacco tissues thus protected by a prior inoculation. The immunity resulting from direct inoculation develops both in old and young plants and extends to cells beyond the actual site of the operation.

Following the method described by Johnson [ibid., vi, p. 43] three attenuated strains of tobacco mosaic were secured and plants inoculated with these strains were found to become immune from both the tobacco and aucuba mosaic viruses. Tests to determine whether inoculation (by needles) with aucuba mosaic would establish immunization from tobacco mosaic failed, possibly on account of inadequate technique. Neither cucumber mosaic nor tobacco ring spot affords protection against aucuba mosaic on inoculation into tobacco plants.

PETHYBRIDGE (G. H.). **Potato diseases.**—*Journ. Min. Agric.*, xli, 2, pp. 125–136, 1934.

In this paper (read at a Potato Conference held at Rothamsted in February, 1934) notes are given designed to assist growers in reducing the losses due to various diseases (with special reference to transmission by the seed tuber), including dry rot [*Fusarium coeruleum*], common scab [*Actinomyces scabies*], skin spot (*Oospora pustulans*), blight (*Phytophthora infestans*), and wart (*Synchytrium endobioticum*). Referring to virus diseases, the author states that in trials of the copper strip test, recently introduced in Germany to discriminate between healthy and degenerate tubers [see next abstract], with leaf roll and healthy potatoes, both caused extensive blackening, so that for diagnosing leaf roll at least the method is apparently useless.

APPEL (O.). **Vitality and vitality determination in Potatoes.**—*Phytopath.*, xxiv, 5, pp. 482–494, 1934.

A full account is given of the application of Wartenberg's and Hey's potentiometric and Bechhold's and Erbe's copper methods of determining the vitality of potato tubers in relation to degeneration diseases (leaf roll, mosaic, and other causes) [*R.A.M.*, xii, p. 531; xiii, p. 465, and preceding abstract].

GRIEVE (B. J.). **Studies in bacteriosis. XX. The spraing disease of Potato tubers.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 233–250, 2 pl., 1934.

After a brief reference to the confusion existing in the literature

dealing with the different forms of corky lesions in the flesh of potato tubers [cf. *R.A.M.*, xiii, p. 393], the author gives an account of his investigations, the results of which showed that the symptoms generally grouped in England under the name 'spraing or internal rust spot' in reality represent two different diseases, which the author suggests designating by the names 'spraing' and 'internal rust spot', respectively. The first, the symptoms of which are confined to the tuber alone, is characterized by arc-like lines or rings of suberized tissue, which are seldom visible on the outside of the tuber, and which, on cutting the affected tuber, appear to have originated from either a lenticel or a slight abrasion of the skin. The number of these rings is variable, and the focal point is often marked by a browning of the tissue just below a lenticel. Occasionally short arcs may be present, apparently unconnected with any surface lesion; such arcs form part of a connected system, although the connexion is not at first obvious. Sometimes, particularly in certain varieties, larger blotchy areas occur in a tuber, but their relation to the system of arcs can always be traced. This condition corresponds exactly to the Dutch potato disease 'kringerigheid' and the German 'Pfropfenbildung' [loc. cit.], and was clearly illustrated by Pethybridge in Ireland in 1913 ('Investigations on Potato diseases. IV.'—*Journ. Dept. Agric. and Tech. Instr. Ireland*, xiii, p. 468, 1913).

In internal rust spot, the flesh of affected tubers is marked with rusty-red to brownish lesions, which occur indiscriminately throughout the tissue and appear to form no connected system. The lesions may vary from mere specks to large, irregular blotch-like lesions having a diameter of 1 cm. or more. The number of spots may be very few in slightly affected tubers, but in cases of heavy development of the disease the rusty-coloured areas are numerous and very variable in size and shape, the severity of the disease appearing to be connected with varietal differences in the tubers. This condition corresponds in some measure to the German 'Eisenfleckigkeit' [loc. cit.].

Isolation experiments showed that neither *Bacterium rubefaciens* [ibid., xi, p. 320] nor *Bact. solaniolens* [ibid., iii, p. 420] occurs in spraing, but there was some slight evidence that bacteria may be concerned in the production of internal rust spot. Inoculations with these organisms consistently gave negative results with *Bact. solaniolens*, and though some slight evidence of infection was obtained with *Bact. rubefaciens*, the results were far from convincing. Spraing was transmitted by tuber grafting in three cases out of eighteen [ibid., vi, p. 179], and in one instance by a ground-up suspension of the arc lesions which was introduced into healthy tubers. All these results incline the author to support Quanjer's view of the virus origin of spraing [ibid., x, p. 746]. Internal rust spot could not be transmitted by tuber grafting, a fact which, together with the more constant occurrence of bacterial organisms in the lesions, suggests that this disease is distinct from spraing, and may possibly be of bacterial origin.

Attempts to isolate a possible infectious principle from the soil have so far given negative results.

HÖHNE (E.) & CHÉLARD (G.). **Hat die Düngung einen Einfluss auf die Schorfbildung bei Kartoffeln?** [Does manuring influence scab development in Potatoes?—*Die Phosphorsäure*, iv, 3, pp. 161–167, 1934.

A fully tabulated account is given of the writers' four years' experiments at the Basic Slag Manufacturers' Agricultural Experiment Station, Berlin-Dahlem, on the effects of various fertilizer combinations on potato scab [*Actinomyces scabies*: *R.A.M.*, xiii, p. 466]. In the trials under discussion Richters Jubel remained practically free from infection notwithstanding the application of calcareous fertilizers and the clay-sandy soil with a reaction of P_H 6·86, while Lembkes Industrie was attacked both in the plots receiving basic slag and in those to which superphosphate was applied. The conclusion is reached that scab is avoidable by the cultivation of the officially recommended resistant varieties, coupled with the liberal use of green and stable manures.

GOSS (R. W.). **A survey of Potato scab and Fusarium wilt in western Nebraska.**—*Phytopath.*, xxiv, 5, pp. 517–527, 1934.

A tabulated account is given of the writer's survey in 1928 of the incidence of scab (*Actinomyces scabies*) [*R.A.M.*, xii, p. 717] and wilt and stem-end rot (*Fusarium oxysporum* and *F. eumartii*) [ibid., vii, p. 597; xii, p. 241] in the high plains area of western Nebraska by planting one-bushel portions of a lot of formaldehyde-treated seed potatoes on each of a hundred farms, selected as representing the widest range of environmental conditions. No fields were entirely free from scab, the average percentages of which in all fields were 10·5 slight, 12·5 medium, and 1·4 severe, with an additional 30 per cent. of superficial infection. Stem-end rot or vascular discoloration was present in 94 per cent. of the fields, the average incidence for all fields being 4·5 per cent., about half of which was severe.

The following factors were found to be correlated with a high proportion of scab infection: cultivated soil or summer fallow the preceding year, as opposed to small grains, an interval of less than four years between potato crops, decreasing soil reaction from P_H 8·25 to 5·92, silt-loam soils as compared with loams or very fine sandy loams, and large numbers of the causal organism in the soil [cf. ibid., xiii, p. 466]. None of these factors appeared to influence the development of *Fusarium* wilt, the incidence of which was less, however, following legumes than after other crops.

DIEHL (R.). **État actuel de la maladie verruqueuse de la Pomme de terre (la question des variétés).** [The present state of the Potato wart disease (the problem of varieties).]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 25–31, 1934.

As a result of tests of European and American varieties of potato that were carried out since 1926 at Russ Hersbach, Bas-Rhin, a list is given of 160 [named] varieties, classified by their resistance or susceptibility to the potato wart disease (*Synchytrium*) [*endobioticum*] and by the country of their origin. The disease is stated to be slowly gaining ground in France, owing to the fact that a large proportion of the varieties commonly used there are

susceptible, and a further list is given of resistant varieties which might usefully replace them. Slightly susceptible varieties, e.g., Ursus and Triumph, should not be used in threatened areas, as they may serve to carry infection.

Mention is also made of preliminary tests of a number of other tuberiferous species of *Solanum* collected by Russian expeditions in South America, the results of which showed that most of them appear to be susceptible to wart disease. Of 27 samples of *S. andigenum* tested only four were found to be resistant, while susceptible types were also found among specimens of ten other South American species of *Solanum*, a list of which is appended [cf. ibid., iv, p. 502].

REDDICK (D.). **Elimination of Potato late blight from North America.**—*Phytopath.*, xxiv, 5, pp. 555–557, 1934.

In addition to the blight (*Phytophthora infestans*) -immune Mexican species of *Solanum* already recorded [*R.A.M.*, xiii, pp. 52, 468], the following are listed here: *S. coyoacanum*, *S. verrucosum*, *S. polyadenium*, *S. sambucinum*, and *S. bulbocastanum*. In hybridization experiments at Ithaca with *S. demissum* as the pollen parent, a very scanty set of seeds has been produced only five times, each time on Rural or its hybrids. The F_1 hybrids are all blight-immune and practically male-sterile, less than 100 individuals of the F_2 having been produced. The property of immunity from blight was found to be heritable, though the mode of transmission cannot be determined from the meagre material available. Nearly all the F_1 plants (90 per cent.) arising from crosses between *S. demissum* as the female parent and cultivated varieties are also blight-immune, while in the F_2 and subsequent generations (or at any rate down to the fourth) reversion to the wild type occurs, with total immunity. The progeny from an immune F_1 plant back-crossed with pollen from a cultivated variety is heterogeneous; of 1,762 plants tested 68 per cent. were immune and a fair proportion yielded tubers approximating to commercial size. When a blight-immune back-cross plant is again back-crossed with pollen from a cultivated variety, heterogeneity is again manifested by the progeny. Of 767 such double back-crossed plants 50 per cent. proved immune from *P. infestans*. From about 200 immune double back-cross plants, a dozen plants have been selected that have the appearance of domestic varieties and about a dozen others approximating to commercial types.

WEI (C. T.). **Rice diseases.**—*Nanking Coll. of Agric. & Forestry Bull.* (*New Series*) 16, 40 pp., 28 figs., 1934. [Chinese, with English summary.]

Between 1930 and 1933, the following organisms causing diseases of rice (arranged in descending order of importance) were observed in the vicinity of Nanking: *Helminthosporium oryzae* [*R.A.M.*, xii, p. 146], *Piricularia oryzae* [ibid., xiii, p. 267], *Rhizoctonia* sheath rot [*Corticium sasakii*: ibid., xiii, p. 264], *Fusarium* blight [(?) *Gibberella fujikuroi*: ibid., xiii, p. 396], *Ectostroma* black stripe, green smut (*Ustilaginoidea virens*), *Phoma* kernel blight [(?) *P. glumarum*: ibid., xiii, p. 592], *Pyrenochaeta oryzae*, *Meta-*

sphaeria albescens, *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xiii, p. 395], *Tilletia horrida* [ibid., xiii, p. 469], *Gibberella saubinetii* [ibid., xiii, p. 263], *Ophiobolus oryzae*, *Brachysporium oryzae* [cf. ibid., xii, p. 146], *Sclerotium sphaerioides*, and *Nigrospora oryzae* [loc. cit.], as well as some obscure or non-parasitic troubles.

In cultures of *H. oryzae* 0- to 3-septate, hyaline spores with a *Hormodendron*-like arrangement, borne on conidiophores and measuring 9·5 to 32 by 4 to 5·5 μ, were noted in addition to the normal conidia.

The conidial stage of *M. albescens* occurred in a germination test and in culture, the hyaline, allantoid to spindle-shaped, usually 1-septate spores measuring 6 to 15 by 3 to 5 μ.

SMITH (F. E. V.). **Report on Pimento disease in the parish of Manchester.**—*Journ. Jamaica Agric. Soc.*, xxxviii, 5, pp. 276–279, 1934.

In April, 1934, a new disease of pimento [*Pimenta acris*] was observed in Jamaica, where it is prevalent over a large part of the parishes of Manchester and St. Elizabeth and occurs in a mild form in other parts of the island. Only the young parts of the trees are attacked. Circular (occasionally irregular) spots, reddish on the upper surface and yellowish, becoming greyish-brown, on the lower, appear on the young leaves; numerous lesions develop on the emerging shoots, the tips of which frequently wither. When the flowers are attacked, the spots appear on the stalks and serious blossom-fall may ensue, with consequent reduction of crop. If the trees have blossomed before becoming infected a large scar frequently forms on the half-grown berries. The type of attack varies considerably on individual trees; in the same field one tree may show no twig die-back and very little leaf spot, but heavy berry infection, whereas on others the blossoms, leaves, and young twigs may all be heavily diseased. The intensity of the attack varies with the district and even with different parts of the same estate. The worst infections are in the south, especially in the localities most exposed to the wind.

The disease is due to a rust, thought to be possibly a species of *Hemileia*, the author's identification of which, however, awaits confirmation. It is thought that the fungus has been present in Jamaica for a long time and that the outbreak (probably favoured by heavy, out-of-season rains during the previous eighteen months), may subside with a return to drier conditions.

BOLLE (P[IERRETTE] C.). **De onderscheiding van gomziekte en daarop gelijkende verschijnselen.** [The differentiation of leaf scald and conditions resembling it.]—*Arch. voor Suikerind. Nederl.-Indie*, Deel I, xlii, 10, pp. 331–334, 5 pl., 1934.

In connexion with a brief discussion of Miss Wilbrink's survey of leaf scald of sugar-cane [*Bacterium albilineans*] and similar manifestations [*R.A.M.*, xii, p. 593], the writer presents in tabular form the typical symptoms of five conditions liable to confusion, viz., leaf scald, fourth disease, wilting of the 'rajoengan', false leaf scald, and chlorotic striping of the leaves following the attacks of a moth (probably *Cosmopterix dulcivora*).

In Hawaii, fourth disease is known as 'chlorotic streak' [ibid., xii, p. 723; xiii, p. 472] and the writer observed it there on the P.O.J. 36 variety. In general, varieties highly susceptible to leaf scald are less so to fourth disease and vice versa.

In false leaf scald, the stripes run between two large vascular bundles and not round them as in the foregoing disturbances. Possibly this is merely a form of the variegated stripes ('soerats') already described by Miss Wilbrink.

Various nutritional deficiencies, e.g., of iron, may lead to the development of chlorotic symptoms resembling those of leaf scald, but in such cases it is the intercostal areas that are affected.

Neither fourth disease nor wilting of the 'rajoengan' has been found infectious, and neither they nor any of the other above-mentioned disturbances, apart from leaf scald, are of any economic importance.

Booberg (G.). **Over het gebruik van gelestrepenziek plantmateriaal.** [On the use of mosaic-diseased planting material.] —*Arch. voor Suikerind. Nederl.-Indie,* Deel I, xlii, 10, pp. 319–331, 4 graphs, 1934.

From a study of the statistical data [which are discussed and tabulated] on the transmission of mosaic disease of sugar-cane through the setts in Java [*R.A.M.*, vi, p. 379; ix, p. 161] the writer concludes that a clear distinction should be made between 'liability to infection' and 'susceptibility' in connexion with mosaic. E.K. 28 and D.I. 52, for instance, are equally liable to infection but the former is much the more susceptible of the two. During the last six years the general use of the resistant P.O.J. 2878 led to the question of mosaic being pushed into the background, but the extreme susceptibility of certain new varieties has once more brought it into prominence. The use of selected, healthy setts is strongly recommended; should it be absolutely necessary to plant diseased material an isolated site must be chosen.

Heck (A. F.). **Some indications of a relation of soil fertility and plant nutrition to Cane diseases in Hawaii.**—*Journ. Amer. Soc. Agron.*, xxvi, 5, pp. 381–389, 1934.

A tabulated account is given of the writer's chemical studies on Hawaiian sugar-cane soils and on the cane juice which are considered to indicate a correlation, positive or negative as the case may be, between readily available plant nutrients and susceptibility to certain diseases.

Root rot, associated with *Pythium aphanidermatum* [*R.A.M.*, xiii, pp. 399, 471], is believed to be steadily increasing both in severity and extent. A low phosphorus and high mineral nitrogen content are outstanding features of the soils in which Lahaina (and of late other varieties also) are affected by this disease, which is regarded as an expression of unbalanced nutrition.

Eye spot (*Helminthosporium sacchari*) [*H. ocellum*: ibid., xii, p. 722; xiii, p. 12] is also usually found on soils with a high mineral nitrogen content, and is possibly correlated with low potassium. The greatest damage is stated to be caused by the so-called 'runner' (the narrow strip of necrotic tissue extending

from the actual area of invasion to the leaf tip) rather than by the lesion itself.

Brown stripe (*H. stenospilum*) [loc. cit.] has been found to be associated with low mineral assimilation by the cane, either of phosphorus, potassium, or both. Resistant varieties, such as P.O.J. 36, are either better feeders on the available phosphorus and potassium in the soil, or are able to make normal growth by the use of less of these nutrients in their metabolism, thus leaving more in solution in the juice.

RAYSS (T.). **Deuxième contribution à la connaissance des Micromycètes des environs de Besse (Puy-de-Dôme).**—[Second contribution to the knowledge of the Micromycetes in the neighbourhood of Besse (Puy-de-Dôme).]—*Bull. Soc. Myc. de France*, xliv, 3–4, pp. 381–421, 3 figs., 1 graph, 1934.

This is a briefly annotated list (in continuation of a previous list published in *Bull. Soc. Myc. de France*, xlvii, 2, pp. 200–220, 1931), arranged in the systematic order of the organisms, of 163 species of fungi belonging to 21 genera which were collected in the neighbourhood of Besse, Puy-de-Dôme, France, and include many parasites. One of the species is described as new to science and named [with a Latin diagnosis] *Peronospora moreaui*, on *Lathyrus macrorhizus*. The hosts are indicated in every case.

MAYOR (E.). **Notes mycologiques. VIII.** [Mycological notes. VIII.]—*Bull. Soc. Neuchâtel Sci. Nat.*, lviii, pp. 7–31, 1933. [Received July, 1934.]

Notes are given on 52 species of fungi, mostly rusts, recorded during 1930–3 in Neuchâtel Canton [*R.A.M.*, ix, p. 409]. The following items are of special interest. *Oidium hortensiae* [*Microsphaera polonica*: ibid., xii, p. 550] was observed in April 1932 on *Hydrangea hortensia*, and recurred in May, 1933, on the same plants. *Entyloma dahliae* [ibid., xii, pp. 177, 550] was not present in 1930 on any of the dahlia varieties affected the year before [ibid., ix, p. 409], but heavy infection developed on all of them by September, 1931, and the disease was very severe in 1932. The attack spread very rapidly on cactus dahlia seedlings grown from American seed.

Puccinia baryi is very common in Switzerland on *Brachypodium pinnatum* and *B. sylvaticum*. In May, 1932, the author inoculated *Berberis vulgaris* plants in a greenhouse with teleutospores taken the previous September from *B. sylvaticum*, and in 13 days slight but distinct infection was present and pycnidia were rapidly forming. Mature aecidia were observed a week later. The experiment was repeated in April, 1933, when considerable infection was visible in five days and some of the aecidia were mature in less than three weeks. On barberry the rust causes sparse spots, 2 to 4 mm. in diameter, orange or red in colour, often vinaceous in the centre, and surrounded by a light yellow zone. The pycnidia develop on the upper surface of the leaf, the aecidia on the lower; the latter are barely $\frac{1}{3}$ mm. in diameter and when mature have a thick, pale yellow edge, slightly if at all torn. In every respect the aecidia resembled those of *P. pygmaea* [ibid., xii, p. 536]. The

aecidiospores of *P. pygmaea* are rounded, 18 to 24 μ in diameter or elongated, 21 to 27 by 16 to 24 μ, the corresponding measurements for *P. baryi* being 19 to 24 and 24 to 27 by 16 μ. The membrane, which is of uniform thickness, is finely verrucose, and though thin is appreciably thicker than that of *P. graminis*. The inner wall of the peridial cells of *P. pygmaea* and *P. baryi* is markedly verrucose and thicker than that of *P. graminis*. Microscopically the aecidia of *P. pygmaea* and *P. baryi* resemble those of *P. arrhenatheri* [loc. cit.], but, like *P. graminis*, they occur on leaves which do not become deformed.

Milesia kriegeriana [ibid., ix, p. 420] is well known in Switzerland in its uredo and teleuto stages on the fronds of *Dryopteris filix-mas* and *D. spinulosa*. In September, 1930, the white aecidia were noted on *Abies alba* near *D. filix-mas* plants which bore numerous uredosori. On 25th July, 1931, aecidia were collected from *A. alba* in another locality and placed in close contact with young healthy fronds of *D. filix-mas*. On 10th August infection had taken place and the first uredosori matured two days later. Similar inoculations were made on 16th July, 1932; by 1st August the first uredosori were mature and by 13th abundant infection was present. A detailed description is given of the pycnidia and aecidia of the fungus as found on the current year's needles of *A. alba*.

TAI (F. L.) & WEI (C. T.). **Notes on Chinese Fungi. III.** *Sinensia (Contr. Metrop. Mus. Nat. Hist. Acad. Sinica)*, iv, 5, pp. 83–128, 55 figs., 1933. [Received August, 1934.]

This annotated and illustrated list, in continuation of those previously published [*R.A.M.*, xii, p. 661], comprises 58 species of Peronosporaceae, including five considered to be new species and one new combination. Among the fungi listed are *Sclerospora graminicola* on *Setaria viridis* [see above, p. 629] and *S. glauca*, *Plasmopara skvortzovii* Miura on *Abutilon avicennae*, *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* on cucumber, vegetable marrow, melon, and *Luffa cylindrica*, *Peronospora manshurica* on *Glycine max* [ibid., xi, p. 316], *Empusa grylli* on *Locusta migratoroides* [ibid., xii, p. 9], *Ophionectria coccicola* on scale insects on the branches of *Citrus nobilis*, *Ustilago tulipae* on the leaves of *Tulipa edulis*, *Uromyces caryophyllinus* on *Dianthus longicalyx*, *Stereostratum corticioides* (B. et Br.) P. Magnus (*Puccinia corticioides* B. et Br.), *P. longicornis*, and *P. phyllostachydis* on *Phyllostachys*, *Puccinia horiana* and *Uredo autumnalis* on *Chrysanthemum indicum*, and *Pileolaria pistaciae* n. sp. on *Pistacia chinensis*.

In a previous publication [ibid., xi, p. 131] the senior author tentatively identified a species of *Myriangium* collected at Nanking as *M. bambusae* Rick, but an examination of type material of the latter showed it to be quite different from the Nanking fungus, material of which was sent to Hara, who recognized it as *M. bambusae* Hara; as this name, however, is a homonym the new name *M. haraeanum* nom. nov. is proposed.

Gymnosporangium haraeanum Syd. and *G. japonicum* Syd. both occur on *Juniperus chinensis*. The former, amongst the synonyms of which are *G. japonicum* Shirai, non Sydow, *G. asia-*

ticum Miyabe, and *G. koreanse* [ibid., xii, p. 396] has for alternate hosts species of *Pyrus, Cydonia,* and *Crataegus* [ibid., xiii, p. 37], while those of *G. japonicum* are *Photinia subumbellata* and *P. villosa.*

The sclerotia of *Poria cocos* are known in China as 'fuhling'. The perfect stage of the fungus was artificially produced by placing fresh sclerotia in moist chambers, and also by cultures on potato glucose agar. It is considered to be identical with the American tuckahoe or Indian bread [ibid., ix, p. 572], and probably also with the Japanese 'bukuxyo', known usually as *Pachyma hoelen.* Fuhling is used in Chinese medicine, and under the name of Chinese root is annually exported in amounts averaging 20,000 piculs [over 1,000 tons]. In southern Honan it is cultivated on small pine poles buried in hill slopes except for one end, which is either inoculated with small flakes of sclerotium or gets naturally infected. At Tai-hu Hsien, Anhwei, the process is more complicated, involving subculturing twice on buried poles before the main crop is grown in a manner similar to that described above.

The name *Cercospora vignae-sinensis* nom. nov. is suggested for the cowpea leaf-spotting organism in place of *C. raciborskii* Matsumoto and Nagaoka (proposed in 1931 to replace *C. vignae* Rac. which was antedated by *C. vignae* E. & E.), as this specific name has already been used for *C. raciborskii* Sacc. & Syd. [on tobacco: ibid., xi, p. 129].

COZIC (Mlle). **Étude biochimique de Bacterium xylinum.** [A biochemical study of *Bacterium xylinum.*]—*Rev. Gén. de Bot.,* xlvi, 541, pp. 1–32; 542, pp. 75–87; 543, pp. 157–171; 544, pp. 209–228; 545, pp. 268–288; 546, pp. 337–359, 16 graphs, 1934.

A detailed account is given of the writer's comprehensive studies on the biochemical aspects of the well-known acetifying organism *Bacterium xylinum,* which is used in the preparation of a tea beverage in Central and Eastern Europe [and also in the East: *R.A.M.,* xii, p. 661]. The following are among the headings under which the subject is discussed: morphology, nature of the cellulosic membrane, appropriate culture media, factors affecting growth, taxonomy, preparation of sugars and polyalcohols, metabolism, action of stains on growth and respiration, oxido-reduction phenomena, inhibition of development by the esters of bromacetic acid and other substances, and the effects of potassium cyanide on the vital functions of the organism.

An eight-page bibliography is appended.

THOMPSON (A.). **Diseases of Tobacco in Malaya.**—*Malayan Agric. Journ.,* xxii, 6, pp. 263–269, 1934.

The most serious disease of tobacco in Malaya is slime disease (*Bacterium solanacearum*) [*R.A.M.,* xiii, p. 475] which is found locally on Deli, Burmese, Joyner, Hickory Prior, White Burley, Russian, Bhengi, and Ceylon tobaccos. In some Joyner plants the disease appeared just before topping; this operation was carried out with a knife, and a few days later a black discoloration was observed to extend down the cut stem and pass into the lower

leaves of previously healthy plants. It is considered probable that infection was carried on the knife. As experience indicates that the disease can cause as much damage in Malaya as in the Dutch East Indies, if large areas in the former locality are to be sown to tobacco, rotation with rice, maize, and *Mimosa invisa* [ibid., ix, p. 349] for seven or eight years may be found necessary.

The leaf spot due to *Cercospora nicotianae* [ibid., xiii, p. 545] is also very common, but it causes very little damage and is not regarded as serious.

The symptoms, manner of spread, and control of tobacco mosaic are briefly described.

VINSON (C. G.). **Possible chemical nature of Tobacco mosaic virus.**—*Science*, N.S., lxxix, 2059, pp. 548–549, 1934.

Contrary to the experimental results of Barton-Wright and McBain, the writer has detected small amounts of nitrogen in safranin precipitates, prepared in the same way, of the virus extracted from mosaic Turkish tobacco plants at Missouri University [*R.A.M.*, xiii, pp. 400, 475]. The nitrogen content of the final virus fraction may be extremely low (only 1 to 2 mg. from 500 c.c. juice), with a correspondingly slight infective capacity. However, when the leaves of ten plants were rubbed with a cloth dipped in the virus preparation, 100 per cent. infection was produced.

Phosphorus was found to be present in the washed safranin precipitate to the extent of about one half mg. per 500 c.c. of juice. In most of the writer's preparations the virus fraction is readily precipitable by means of a small amount of N/1 aluminium sulphate solution, but this does not hold good for those obtained by the amyl alcohol procedure.

TAKAHASHI (W. N.) & CHRISTENSEN (R. J.). **The virucidal action of high frequency sound radiation.**—*Science*, N.S., lxxix, 2053, pp. 415–416, 1934.

Using an apparatus similar to that described by Harvey *et al.* (*Biol. Bull.*, lv, p. 459, 1928), the writers carried out experiments to determine the effect of high frequency sound radiation on the tobacco mosaic virus. The sound radiation originated in the vibration of a 1 in. sq. quartz crystal immersed in a water-cooled, circulating oil bath and excited by means of a 75-watt vacuum tube oscillator in connexion with a step-up voltage arrangement. The natural frequency of the crystal was 450,000 cycles per second. Three c.c. of centrifuged juice from crushed, frozen tobacco leaves were pipetted into a small test-tube, the end of which was enclosed in a thin-walled bulb about 1 in. in diameter; the latter was immersed in the oil bath directly above the quartz crystal. Separate samples from the same lot of juice were irradiated for 30, 60, and 120 minutes. After each test the temperature of the liquid within the bulb was found to have risen from 24° to about 35° C., but this increase was found to play no part in the inactivation of the virus, the total number of local lesions formed on 20 half leaves of *Nicotiana glutinosa* inoculated by the method of Holmes [*R.A.M.*, viii, p. 532] and Samuel and Bald [ibid., xii, p. 526] being 1,052

for juice held at 35° and 1,058 for unheated. The numbers of local lesions per 20 half leaves inoculated with juice subjected to 30, 60, and 120 minutes' sound radiation and diluted 1 in 500 were 50, 9, and 0, respectively, compared with 980, 1,446, and 872, respectively, for untreated, similarly diluted juice. The corresponding figures for a similar experiment but with juice diluted 1 in 50, were 584, 52, 0, and 1,301, 1,218, and 1,116, respectively.

The results of these and five other experiments are considered to denote that the tobacco mosaic virus undergoes progressive inactivation with increasing periods of exposure to sound radiation.

VAN DER POEL (J.). **De invloed van den basentoestand van den grond op Tabaksbibit en eenige andere tropische gewassen in Deli.** [The influence of the basic reaction of the soil on Tobacco seedlings and a few other tropical crops in Deli.]—*Bull. Deli Proefstat. te Medan-Sumatra*, 31, 64 pp., 1934. [English summary.]

In order to determine the influence of the basic soil reaction on the growth of various tropical crops at Deli, Sumatra, and on the incidence of slime disease (*Bacterium solanacearum*) in tobacco and *Ricinus communis* [see above, p. 657], these crops were experimentally grown on the three principal soil types of the Deli tobacco belt, viz., black dust rich in humus ['zwarte stofgrond'], red dacitic with a low humus content, and alluvial sandy loam, adjusted towards the acid side by the admixture of flowers of sulphur, and towards alkalinity by that of hydrated lime and marl.

Tobacco seedlings grown on the acid plots of the black dust soil (P_H 3·9 or 4·1) developed spoon-shaped, dark green, brittle leaves and a defective root system. At P_H 4·5 the leaf symptoms were similar but the roots were somewhat better developed. On the loam plots receiving an acid fertilizer (P_H 3·7) the plants showed chlorosis of the leaves, except for the veins, while necrotic spots developed on those grown at P_H 7·9, 7·8, and 7·5. Slime disease did not affect tobacco or *R. communis* on the strongly acid or alkaline plots. An experiment with tomatoes in zinc trays showed that slime-sick soil from the fields could be freed from infection by treatment with bicarbonate of potash or tobacco ash, so that lime compounds are not specific in their action against *Bact. solanacearum*.

Top rot, tentatively attributed to boron deficiency [ibid., xiii, p. 600], occurred exclusively among the tobacco plants in plots with a strong alkaline reaction (87 to 90 per cent. at P_H 7·9 to 8, compared with 41 per cent. at P_H 7·7 and none at P_H 7·5).

BEWLEY (W. F.). **Tomatoes: cultivation, diseases, and pests.**—*Min. of Agric. and Fish. Bull.* 77, v+71 pp., 4 pl., 1 plan, 1 diag., 1934.

This very useful publication, based on the knowledge that has been attained at the Cheshunt Experimental and Research Station, deals at length with the cultivation of the tomato under glass in Great Britain, and contains also information on the construction and heating of tomato houses. A special section is given to a brief description of the common diseases of the crop, which are dealt

with under the following headings: seedling and young plant diseases, root diseases and wilts, stem diseases, leaf diseases, virus diseases, fruit diseases, and physiological disorders [see below, p. 663], and also of the more important insect pests. Control measures are briefly indicated in each case.

CALDWELL (J.). **The physiology of virus diseases in plants. V. The movement of the virus agent in Tobacco and Tomato.** —*Ann. of Appl. Biol.*, xxi, 2, pp. 191–205, 1 pl., 1934.

The results of continued experiments with the virus of aucuba or yellow mosaic of tomato [*R.A.M.*, xii, p. 527] showed that in inoculated plants the symptoms of the disease only appear in those tissues which have developed after infection, and that the virus may be present in apparently normal tissues, in the absence of any macroscopic symptoms. It is much more abundant in chlorotic spots than in the normal green tissue of mottled young leaves, the ratio in inoculated tomato plants being of the order of 5 to 1. The same was also true of tobacco plants inoculated with Johnson's No. 1 tobacco mosaic, but in this case the ratio was of the order of about 20 to 1, the difference being explicable by the difficulty of cutting out test discs of green tissue free from all traces of chlorotic tissue from tomato leaves. The results are considered to indicate that the multiplication of the virus is not uniform throughout the tissues of the host plant, and that not only do adult tissues not induce much multiplication but that there is some factor, at present not clearly understood, which makes certain irregular areas of the developing tissues unsuitable for multiplication of the virus.

Reference is also made to a large series of experiments, in which the transmission was tested of the virus agents of tobacco mosaic, hyoscyamus III [ibid., xii, p. 243], and 'green' by tobacco seed, and of aucuba mosaic, tobacco mosaic, streak, and spotted wilt by tomato seed. The fact that in no case was any evidence of transmission obtained would indicate that the chance of seed transmission of these viruses is very slight.

In a further set of experiments, the movement was studied of the virus of tobacco mosaic from inoculated tobacco leaves which were exposed to light or were completely darkened after inoculation by being enclosed in a black cloth envelope. The results showed that the virus can move independently of the food materials, and that under certain conditions, the virus apparently moves in a direction opposite to that of the metabolites.

CALDWELL (J.). **The physiology of virus diseases in plants. VI. Some effects of mosaic on the metabolism of the Tomato.** —*Ann. of Appl. Biol.*, xxi, 2, pp. 206–224, 2 pl., 7 graphs, 1934.

The results of the experiments briefly described in this instalment of this series showed that the amount of distortion and chlorosis induced in the tomato (Kondine Red variety) by the aucuba or yellow mosaic virus [see preceding abstract] depends on the stage in the development of the host at which it was inoculated, the symptoms being much more uniform and pronounced in plants infected as seedlings than at a later stage (e.g., the fifth

normal leaf stage). This effect is correlated with the fact that the virus inhibits the formation of chloroplasts but does not affect those already formed. Since the number of chloroplasts depends more or less on the leaf area of the plant, it follows that plants inoculated as seedlings, which have the least number of preformed chloroplasts, are much more starved as compared with the controls than are those which are inoculated when they have a number of well-developed leaves in full photosynthetic activity. This conclusion was well supported by the analytical determination of the dry matter and total carbohydrates content, which showed that in plants that were inoculated at the seedling stage the dry matter content was of the order of 7 to 8 per cent., in those inoculated at the fifth normal leaf stage of the order of 10 to 12 per cent., and in the controls of 14 to 15 per cent. The content of total carbohydrates was found to be 1·1, 1·3, and 1·6 per cent., respectively. The nitrogen content was not materially affected. The work also indicated that the stage of development of the host is not apparently affected by the disease, since the diseased plants, though reduced in size, had the same number of leaves and flower trusses as the controls, independently of the stage at which they had been inoculated.

In experiments to establish the effect of the virus on the respiratory mechanism of the host tissues it was found that the CO_2 output of the infected tissues is higher than that of the controls, as expressed in mg. of CO_2 per three-hour period in terms of the initial fresh weight, the residual dry matter content, or the residual nitrogen content. This higher CO_2 output was also found when the plants were kept in oxygen or nitrogen atmospheres. It is attributed to an increase brought about by the virus in the efficiency of the enzyme system in the diseased plants.

READ (W. H.). **Physiological investigations of mosaic disease of the Tomato**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 64–67, 1934.

Examination in localities in England where severe outbreaks of tomato mosaic occur every year showed that the subsoil was almost invariably wet and sour. When the variations in the carbohydrate metabolism of healthy tomato plants and others artificially inoculated with aucuba mosaic [see preceding abstract] were studied by analysis of samples taken at intervals of two hours throughout a period of twenty hours the results obtained suggested that in the laminae of tomatoes affected with aucuba mosaic there is a time-lag in the conversion of reducing into non-reducing sugars [*R.A.M.*, xii, p. 732]. In the healthy laminae the concentration of reducing sugars rose during the day until it reached a maximum at 3 p.m. In the diseased laminae the amount of reducing sugars rose to a maximum at 3 p.m. and then fell rapidly, while the concentration of the non-reducing sugars began to increase at noon, reaching a maximum only at 6 p.m. The mean concentration of reducing sugars in the healthy and diseased laminae showed little difference, but the amount of non-reducing sugars was much greater in the former. The starch values showed no marked difference apart

from slightly greater amounts in the healthy laminae, a result at variance with those of previous experiments [loc. cit.]. Examination of the petioles showed that in healthy plants reducing sugars were present in larger amounts than non-reducing sugars; the latter showed little variation throughout, but the amount of reducing sugars present rose to a maximum at 6 p.m. and fell to a minimum at 2 a.m. In the diseased petioles reducing and non-reducing sugars were present in approximately equal amounts between 8 a.m. and 7 p.m., showing the same maxima at noon and 6 p.m.

BALD (J. G.) & SAMUEL (G.). **Some factors affecting the inactivation rate of the virus of Tomato spotted wilt.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 179–190, 3 graphs, 1934.

In continuation of their studies of the properties of the virus of tomato spotted wilt [*R.A.M.*, xi, p. 549; xii, p. 526] the authors give a brief account of experiments, the results of which showed that stirring the inoculum during the process of inoculation accelerated the speed of its inactivation, the same effect also resulting from bubbling air through the inoculum, and also from the addition to it of either of the two oxidizing agents, chloramine T or hydrogen peroxide. A slight delay in the loss of virulence was obtained by the removal from the inoculum of all but traces of free oxygen by bubbling nitrogen through it, but the final rate of inactivation remained practically unchanged. Of the six reducing agents which were tested, ferrous sulphate, tannic acid, hydroquinone, and cysteine hydrochloride accelerated inactivation, sodium nitrite retarded it slightly, while sodium sulphite retarded it very markedly, these varying effects being possibly due to differences in hydrogen-ion concentration, or to various unrelated properties of the introduced ions; it is pointed out, in particular, that nothing was known of the oxidation-reduction potentials which were actually induced in the inoculum by the addition of the reducing substances.

These results do not yet decide the question whether the inactivation of the virus of tomato spotted wilt on standing is due to a reaction of the nature of an oxidation, and further work is now in hand, in which account is being taken of the factors indicated above.

MCWHORTER (F. P.). **English form of Tomato spotted wilt found in Oregon greenhouse.**—*Plant Disease Reporter*, xviii, 3, pp. 25–26, 1934. [Mimeographed.]

When inoculations by rubbing were made to the leaves of petunia plants from tomatoes grown in a greenhouse in Oregon (from seed directly imported from England) and showing symptoms of a disease unfamiliar to the grower but recognized at the State College to resemble spotted wilt [*R.A.M.*, xiii, p. 333 and preceding abstract], positive results were obtained in all cases, the rubbed leaves developing lesions typical of the English form of the disease as described and figured by K. M. Smith [ibid., xii, p. 59]. As this

is considered by Smith to be a conclusive test for the disease, the presence of spotted wilt in Oregon is held to be established.

BEWLEY (W. F.). **Some physiological disorders of glasshouse crops.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 319–322, 1934.

In this note the author gives brief descriptions of the more important physiological troubles which affect tomatoes and cucumbers grown under glass in England. The following tomato troubles are discussed. Blossom-end rot, due to a disturbance of the balance in water requirement between foliage and the developing fruit. Bronzing of the tissue immediately under the skin of the fruit, believed to be connected with the development of excessive top growth followed by a check due to hot dry soil. Blotchy ripening, sometimes known as 'bad penny' or 'waxy patch', characterized by green patches on the fruit, which may assume a yellow or orange colour during ripening but never reach the full red colour; this is a nutritional disorder occasioned by deficiency of nitrogen and more particularly of potash, and in many cases it may be remedied by the addition of a phosphatic manure which assists the plants to take in additional potash from the soil, and also by subsoil manuring. Potash deficiency was also shown to be responsible for the condition known as 'green back', in which the fruit develops a green patch around the stalk end; this area remains hard and changes to a greenish yellow during the process of ripening. Another important factor contributing to this last condition is high temperature, which inhibits the production of the red lycopin pigment, and a measure of control may be obtained by providing adequate shade to the fruits while ripening. Blossom drop was shown to be due to dry soil conditions, and the condition known as 'dry set' to arise directly from failure of pollination, generally under conditions of air humidity insufficient for germination of the pollen grains; it may be prevented by spraying the plants with water as soon as the flowers begin to open. The 'hollow fruit' trouble is the result of irregular development due to alternations of rapid and slow growth. A disorder which has recently given trouble is 'oedema' or 'dropsy', in which furry blisters are found on the underside of the leaves and on the fruit stalks, followed by considerable twisting and distortion of the leaves and shoots; this is due to excessive water-supply to the roots, and does not occur in well-lighted, reasonably dry, and moderately watered houses. Of the two troubles that may develop during marketing of the fruits, mottling occurs when the temperature is too high for the proper formation of the red pigment, and softness of the fruit is due to bad ventilation of the boxes.

The only disorder of the cucumber dealt with is the one usually known as 'damping-off' of the fruits. It is due to a weakened constitution of the plants induced by imperfect root development, root decay, or the strain of intensive fruit production, and may be controlled by allowing the plants to rest by ventilating the houses and leaving the beds to dry, the foliage being maintained by 'damping down' the house at regular intervals. After seven to ten days of this treatment the plants should be trimmed, and the beds dressed with good compost and watered.

VANINE (S. I.). Методы исследования грибных болезней леса и повреждений древесины. [Methods for the investigation of fungal diseases of forest trees and injuries to timber.]—228 pp., 95 figs., 4 graphs, Гослестехиздат. [State Forestry Techn. Publ. Office], Leningrad, 1934.

The subject of forest pathology is discussed in a somewhat elementary fashion, while more detailed consideration is given to technical methods for the notation of the incidence and severity of attack of fungal diseases in forest stands, isolation and culturing of the causal organisms, and their identification. Timber-rotting and-staining fungi are similarly dealt with in a separate chapter. The main feature of the book is the inclusion in it of keys for the determination of the organisms by their cultural characters and by the character of the rots induced by them in living trees and in felled timber, as well as a fairly detailed morphological and cultural description of some 45 species of lignicolous Basidiomycetes occurring in Russia, all of which are illustrated by original figures. The relevant literature is given in bibliographical lists at the end of each chapter, and the book terminates with a list of dioecious tree rusts with an indication of their alternate hosts.

CHAMBERLIN (J. E.). **To arms for the American Elm.**—*Amer. Forests*, xl, 5, pp. 195–199, 230–232, 7 figs., 1934.

A popular appeal is made for the co-operation of the American public in the campaign against the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xiii, pp. 196, 548], on behalf of which Congress appropriated in April, 1934, $150,000 for control and $50,000 for research.

Les pourritures du bois de Chêne sur pied. [The rots of the wood of standing Oak.]—*Bull. Soc. Centr. Forest. Belgique*, xli, 4–5, pp. 179–194, 1934.

This semi-popular account of rots caused by *Polyporus dryadeus*, *Fomes robustus*, and *Stereum* spp. which affect standing oak trees in France is a reprint of a paper already noticed from another source [*R.A.M.*, xii, p. 795].

NICOLAS (G.) & AGGÉRY (Mlle [B.]). **Note sur deux champignons du Tilleul.** [Note on two fungi on the Lime tree.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 18–24, 2 pl., 1934.

A brief account is given of two fungi, considered to be new to science, which were found in 1933 on dead and dying twigs of young Dutch limes (*Tilia grandifolia*) [*T. platyphyllos*] which had been planted in 1930 in the suburbs of Toulouse. The first appeared in the form of very numerous black stromata of varying shape and size, at first immersed and later erumpent, which develop into pycnidia with a single, very irregularly contoured cavity from which the spores are exuded in a greyish-white mucus through an ostiole. The spores are hyaline, elliptical, slightly fusiform, straight, continuous, and 5 to 8 by 2 to 2·5 μ in diameter; they are borne on slightly bent sterigmata, tapering towards the apex, and 10 to 14 μ in length. The organism is named *Dothiopsis tiliae*. The second fungus is characterized by a fairly loose stroma, white

inside and orange-coloured on the surface, very irregular in shape, at first immersed and later erumpent. The spores are formed on very long (150 to 160 μ), septate conidiophores arising from the surface of the stroma; they are hyaline, ovoid, occasionally slightly bent, with a faintly brownish-yellow wall, at first one- and later two-celled, and measure 14 to 20 by 7 to 8 μ. This fungus is named *Septomyxa longipes*. Latin diagnoses of both species are appended.

While the relationship of these two organisms to the host has not yet been established, the indications are that *D. tiliae* is parasitic and may be the cause of the death of the twigs. *S. longipes*, on the other hand, is believed to be a saprophyte, appearing on the host long after the first; there was also some evidence that it is capable of parasitizing the pycnidia of *D. tiliae*.

VENKATA RAO (M. G.). **A preliminary note on the leaf-curl mosaic disease of Sandal.**—*Mysore Sandal Spike Invest. Ctte. Bull.* 3, 5 pp., 4 pl., 1934.

The writer's preliminary investigations on the leaf curl mosaic of sandal (*Santalum album*) in south India have already been noticed from another source [*R.A.M.*, xiii, p. 338].

GUYOT (A. L.). **Note sur une maladie chancreuse du Pin sylvestre dans le Nord de la France.** [Note on a canker disease of *Pinus sylvestris* in the north of France.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 33–38, 1 pl., 1934.

A brief account is given of a disease of *Pinus sylvestris* which has been observed for several years in northern France, where this tree is chiefly used for the reafforestation of steep, calcareous declivities, the soil on which is very dry and permeable, with the consequence that the trees on it make but a poor growth and are frequently subject to the attacks of fungal and insect parasites. The trouble in question is characterized by the formation on the twigs, especially of young and debilitated trees, of ovoid or fusiform, depressed cankers up to 15 cm. long but never over 3 cm. wide, frequently filled with large masses of solidified gum-like substance; the affected shoots and twigs wilt and finally die. The lesions were found to be in constant association with a Discomycete, with asci 73 to 90 by 8 to 11 μ, fusoid, straight or slightly bent, hyaline, continuous or bicellular ascospores, 16 to 27 by 4 to 6 μ, and filiform paraphyses, 2 μ in diameter. These characters are intermediate between those of *Crumenula pinicola* [*R.A.M.*, xi, p. 136] and *C. sororia*, and since the French fungus appears to be a connecting link between these two species, the author considers that they should be reunited under one name, which for reasons of priority should be *C. pinicola*.

BOYCE (J. S.), CARLISLE (G.), FOSTER (J.), HAWLEY (R. C.), RILEY (J. E.), & TILLOTSON (C. R.). **Control of the White Pine blister rust. Sub-committee report to New England section, Society of American Foresters.**—*Journ. of Forestry*, xxxii, 5, pp. 590–593, 1934.

The outstanding fact emphasized in this report in relation to

white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*) is that, in the absence of control, the tree cannot be perpetuated in New England except over limited areas where the number of currant and gooseberry bushes is small [*R.A.M.*, xiii, p. 282]. In those forests where white pine forms a significant proportion of the stand (upwards of 21 per cent.), it is a highly desirable, and probably an essential species, being adapted to special uses for which none of the proposed substitutes so far tested is equally appropriate. Initial control had been established at the end of 1933 on 81·2 per cent. of the total pine area of New England worth protecting against the rust, while in 10·2 per cent. of the region the *Ribes* eradication campaign was maintained by reworking. The annual charge for the protection of white pine from blister rust in blocks of 50 acres and upwards will vary from 4 to 15 cents per acre annually over the period of the rotation.

RÖHRIG (H.). **Verbreitung und Bekämpfung des Kiefernbaumschwammes in den Staatsforsten des Regierungsbezirks Potsdam.** [The distribution and control of the Pine tree fungus in the State forests of the Potsdam administrative district.]—*Forstarchiv*, x, 9, pp. 137–146, 1934.

The information on the distribution of *Trametes pini* [*R.A.M.*, vii, p. 292; x, p. 631] in the pine forests of the Potsdam administrative district of Germany is summarized, with observations on the systematic campaign for the eradication of the fungus now in progress under Government auspices. During the period 1928–31, 31 per cent. of the total number of infected trees found were felled.

LÖFFELMANN. **Auftreten der Schütte (Lophodermium macrosporum R. Hart.) an Fichtenstangenhölzern im westlichen Erzgebirge.** [The occurrence of leaf fall (*Lophodermium macrosporum* R. Hart.) on Spruce pole timber in the western Erzgebirge.]—*Südetendeutsche Forst- und Jagdzeit.*, xxxiii, pp. 13–14, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 3, p. 64, 1934.]

Lophodermium macrosporum [*R.A.M.*, x, p. 416] has been observed producing a rust-brown discoloration of spruce [*Picea excelsa*] foliage on the slopes of the Rothaubach Valley and its extensions in the western Erzgebirge [Saxony], the affected crowns presenting a mottled appearance. The trees have been suffering from the after-effects of smoke injury from a factory transferred elsewhere in 1930, and an improvement in their condition may ensue on the gradual recovery of the soil from acidification.

LUTZ (L.). **Les champignons du genre 'Xanthochrous', agents de destruction des bois sur pied ou abattus.** [Fungi of the genus '*Xanthochrous*', decay agents in standing or felled timber.]—*Bull. Soc. Myc. de France*, xlix, 3–4, pp. 377–380, 1934.

The author gives a brief account of his investigation of the rot caused by *Xanthochrous* [*Polyporus*] *hispidus* (stated to attack a fairly wide range of forest, ornamental, and fruit trees in France)

in plane trees and by *X.* [*P.*] *cuticularis* in oaks [*R.A.M.*, vii, p. 812], the results of which showed that the effect of these fungi on the ligneous substance of the hosts is very similar in its main lines to that of *Coriolus* [*Polystictus*] *versicolor* described by him in a previous communication [ibid., x, p. 700].

MOLL (F.). **Ancora sulla imbibizione e conservazione dei legnami.** [A further note on the impregnation and preservation of timber.]—Reprinted from *Il Legno*, xii, 11, 3 pp., 1934.

During the period 1930–3 there was a considerable reduction in the number of telegraph poles subjected to preservation in Germany as compared with former years (100,000 per annum, of which three-quarters were treated by the Rueping process and the remainder by kyanization) [*R.A.M.*, xi, p. 15; xii, p. 670]. Some recent Italian estimates of the durability of treated timber are stated to require correction, the averages for five standard methods, from well-founded information at the writer's disposal, being as follows: Rueping (60 kg. of oil per cu. m.) 33 years, kyanization 27, impregnation with zinc chloride 14, Boucherie [ibid., xi, p. 815] 20, and basilite [ibid., xi, p. 14] 16. Aczol [loc. cit.] has given somewhat disappointing results, the utility of the poles treated with this substance extending over a period of only ten years instead of the anticipated 15. A provisional estimate for the durability of the Giussani process, combining coal-tar and zinc chloride, is 15 years.

LIESE [J.]. **Holzschutz im Hochbau.** [Wood protection in the superstructure.]—*Biol. Reichsanst. für Land- und Forstw., Flugbl.* 91, Neubearb. 2. Auflage [2nd revised edn.], 4 pp., 1934.

Some general observations are made on the activities of wood-destroying fungi in relation to the protection of structural timber in Germany, supplemented by a list of preservatives of established efficacy with directions for their application.

SANBORN (J. R.). **Microbiological film production.**—*Indus. & Engin. Chem.*, xxvi, 5, pp. 532–533, 1 fig., 1934.

An extended account is given of the writer's investigations on slime-forming organisms in American pulp and paper mills, and their utilization in the production of parchment, a note on which has already appeared [*R.A.M.*, xii, p. 545]. The species of *Oidium* and *Monilia* concerned are provisionally referred to *O.* [*Oospora*] *lactis* [ibid., xiii, p. 579] and *M. candida* [*Candida vulgaris*].

OGILVIE (L.) & MULLIGAN (B. O.). **Progress report on vegetable diseases. V.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 98–120, 2 pl., [1934].

As in previous years [cf. *R.A.M.*, xi, p. 758; xiii, p. 139] this report contains notes on a number of diseases of interest. Of various control treatments tested against root rot of violets (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*] only mercuric chloride 1 in 1,600 appeared to be at all effective.

Some of the varieties of dwarf beans [*Phaseolus vulgaris*]

previously found to be resistant to halo blight (*Bacterium medicaginis* var. *phaseolicola*) [ibid., xiii, p. 139] are now being extended in the Evesham area with satisfactory results. The value of early roguing in control was demonstrated.

Varietal trials with dwarf beans for resistance to foot rot (*Fusarium solani* var. *martii* (syn. *F. martii* var. *phaseoli*) [ibid., xi, p. 759; xii, p. 71] and possibly other *Fusaria*) indicated that Superlative, Black Wonder, and perhaps other varieties are somewhat resistant. Observations confirmed the view that the disease can remain active in the soil for many years even when dwarf beans are not grown.

Part of a large planting of Prizewinner runner beans [*P. multiflorus*] was very severely affected by *Bact. medicaginis* var. *phaseolicola* while part was practically healthy; inquiry showed that to assist germination the grower had soaked some of the seed in warm water for six hours before planting and that this seed had given rise to the severely diseased plants. Seed similarly treated at the Research Station gave 77 per cent. infection as against 18 per cent. for the unsoaked controls.

The first symptoms of the wilt of runner beans previously reported to be associated with a *Fusarium* [ibid., xiii, p. 139] may appear on the primary pair of entire leaves, the margins of which turn yellowish green, this being followed by the wilting and withering of parts of the leaf blade, which becomes dry and brittle. The margins of the later compound leaves often roll inwards and the leaflets droop. These symptoms appear progressively in the younger leaves until the whole plant withers and dies. In varietal resistance trials the following gave the best results in descending order of resistance: Giant Painted Lady, Czar, Sutton's Scarlet, Painted Lady Giantess, and White Prizewinner. Positive results in artificial inoculation experiments in pots were obtained by soil inoculation with the *Fusaria* concerned in three localities, and with diseased bean stems, and in the open by soil inoculation with the *Fusarium* obtained from one locality, the causal organism being reisolated in all cases.

Brussels sprouts plants given two applications of 1 in 1,600 mercuric chloride solution, at the rate of about ½ pint to each plant, showed 28 per cent. free from club root (*Plasmodiophora brassicae*), as against 7 and 12·5 per cent., respectively, for two lots of untreated controls.

In a varietal trial of winter lettuces for resistance to ring spot or 'rust' (*Marssonina panattoniana*) [ibid., ix, p. 224] the least infection was shown by May King, Syston Glory, and Standwell. In a similar test against *Botrytis cinerea* [ibid., xiii, p. 559] the varieties Spring Beauty, Imperial, Arctic, and Lee's Immense showed 96, 95, 85, and 85 per cent. survivals through the winter, respectively. Much of the non-hearting of lettuces in the Evesham area is attributed to mosaic.

As in previous years, late autumn or early winter spraying with tar-oil gave considerable control of mint rust (*Puccinia menthae*) [ibid., ix, p. 558]. The teleutospores were found to germinate at temperatures tested between 33° and 60° F.

Further satisfactory inoculations were carried out on peas with

cultures of the *Fusarium martii* group [ibid., xiii, p. 139] associated with foot rot. The work on pea seed disinfection [loc. cit.] was continued. Diseased seed (infected mostly with *Mycosphaerella pinodes* and *Ascochyta pisi*) treated with ceresan gave a crop of 1,076 lb. as against one of 1,000 lb. from the control.

WHITE (H. L.). **Vegetable diseases.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 52–54, 1934.

After briefly describing the symptoms of grey mould or wilt of lettuce (*Botrytis*) [*cinerea*: see preceding abstract] the author states that few of his direct isolations from diseased plants yielded the fungus, contaminating bacteria, which proved to be incapable of causing serious primary lesions or killing the plants as occurred when the *Botrytis* was used, being frequently obtained. The latter fungus caused a true vascular wilt due to toxins liberated by it, and differed in this respect from *Sclerotinia sclerotiorum*.

Material damage to autumn-grown glasshouse runner beans [*Phaseolus multiflorus*] was caused by a wilt in some respects resembling that described by Butcher as due to *Bacillus carotovorus* [*R.A.M.*, iv, p. 647], but in others agreeing rather with that caused by *Fusarium martii* var. *phaseoli* [see preceding abstract]. Isolations have so far yielded only bacteria.

LARSON (R. H.) & WALKER (J. C.). **Soil treatment in relation to clubroot of Cabbage.**—*Journ. Agric. Res.*, xlviii, 8, pp. 749–759, 1934.

This is a detailed report of the authors' experiments from 1930 to 1932, inclusive, in Wisconsin, carried out in continuation of Wellman's investigation on the control of club root (*Plasmodiophora brassicae*) of crucifers [*R.A.M.*, ix, p. 693], especially on the cabbage. The results of field tests on two types of silty clay loam showed that calcium hydrate and calcium or magnesium carbonate, at doses sufficient to raise the P_H value of the soil to 7·1 and over, did not generally inhibit the development of the disease. Under greenhouse conditions, however, infection of the plants was perceptibly reduced in the same soils treated with sufficient amounts of these three substances and of calcium oxide to raise their reaction to about P_H 7, and was usually completely inhibited at P_H 7·2 or above at high, intermediate, and low, relatively constant moisture levels; fluctuations in soil moisture at relatively low levels and forced aeration of the soil, however, permitted varying degrees of infection. These results are considered to indicate that low, fluctuating soil moisture is an important factor in limiting the efficacy of lime in the control of club root in the field.

WALTON (C. L.), OGILVIE (L.), & MULLIGAN (B. O.). **Observations on the Pea strain of the eelworm Heterodera schachtii and its relation to 'Pea sickness'.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 74–85, 2 pl., [1934.]

Peas in the Evesham district of Worcestershire attacked by the eelworm *Heterodera schachtii* are almost invariably also affected by foot rot caused by *Fusarium* spp. [*R.A.M.*, xiii, p. 139]. When

severely attacked, the diseased plants are dwarfed, pale, and tend to die off prematurely. Affected areas usually occur in well-marked patches in the field. So far as has been ascertained at present, the dwarfing and yellowing are mainly due to the eelworm and the premature death to the *Fusaria*. There appears to be no intimate relation between the organisms causing the two sets of symptoms, and no correlation was established between soil type and the amount of nematode infestation or foot rot present. Further investigations are in progress.

RADEMACHER (B.). **Erfahrungen über die wichtigsten Krankheiten der Ackerbohne und ihre Bekämpfung.** [Experimental observations on the most important Broad Bean diseases and their control.]—*Deutsche Landw. Presse*, lxi, 21, pp. 253–254; 22, pp. 275–276; 23, p. 290, 8 figs., 1934.

A broad bean (*Vicia faba*) disease of which the importance is not generally recognized in Germany is foot rot, attributed by H. Pape to *Fusarium* [*herbarum* var.] *tubercularioides* and by Kirchner to *F. vasinfectum* [*R.A.M.*, vi, p. 258], which causes a black discoloration extending from the root or stem base over the whole plant and eventually leading to general collapse. The symptoms are most pronounced during the hot weather of July and August. The pods (chiefly when injured) and seeds may also be attacked. In 1933 the reduction of yield through foot rot on five varieties at Kitzeberg (a north German branch of the Biological Institute) ranged from 29 to 46·9 per cent. Early sowing has been found to diminish the incidence of foot rot, the percentage of which on the Rosenhof variety sown on 29th March, 1933, was only 15·1 compared with 69 for the planting of 4th May. Another form of foot rot is caused by *Bacillus phytophthorus*.

Rust (*Uromyces fabae*) [ibid., xii, p. 749] is also responsible for heavy losses in late-sown broad bean crops, especially of the Lohmanns Weender and Oberbehmer Dicke varieties, Friedrichswerther, Lüneburger Saxa, and Rosenhofer being comparatively resistant to this disease. Anthracnose (*Ascochyta* spp., including *A. pisi*) [ibid., x, p. 284] occasionally causes severe injury to leaves, stems, and pods, while two leaf spots, *Cercospora zonata* and *C. fabae* [ibid., xii, p. 747], are usually of minor importance. Böning's investigations on mosaic of *V. faba* [ibid., vii, p. 134] are briefly summarized.

HIRATSUKA (N.). **Physiological studies on Uromyces fabae, f. sp. Viciae-Fabae.**—*Bot. Mag.*, Tokyo, xlviii, 569, pp. 309–325, 4 figs., 1934.

A detailed, tabulated account is given of the writer's physiological studies on *Uromyces fabae* f. sp. *viciae-fabae* [*R.A.M.*, xii, p. 596] in Japan.

The optimum temperature for uredospore germination in the rust appears to range from 16° to 22·5° C. On a film of sterilized water at 20° to 22° germination commenced within 50 minutes, and by the end of 12 hours the germ-tubes had attained a length of 560 μ and were branched. Maltose, lactose, d-glucose, sucrose, and l-fructose in varying concentrations proved suitable media for

the germination of the uredospores, which was not appreciably influenced by light or darkness. The uredospores succumbed to 5 minutes' exposure to wet heat at 46°, 10 minutes' at 42° to 44°, 20 minutes' at 40°, and 30 minutes' at 38°; at 0° to 5° viability was maintained for more than 75 days. The maximum development of uredosori in inoculation tests on broad beans took place at 14° to 24°, decreasing at 26° to 30°, while at 2° to 6° there was no sign of infection. The numbers of stomata on the upper and under surfaces of broad bean leaves are almost equal, with the result that the uredosori of the rust occur in the same profusion on both. All the five broad bean varieties tested were susceptible to infection, but some degree of resistance was shown by seven of the eighteen pea varieties used, namely, Forty days edible podded, American Wonder, Sapporo-ao, Marrowfat No. 2, Dwarf podded, Dwarf sugar, and Radio.

Canada Department of Agriculture, Destructive Insect and Pest Act Advisory Board, Regulations under the Destructive Insect and Pest Act, Regulations Nos. 14 (Foreign) 5th Revision, 17 (Foreign) 1st Revision, and 20 (Foreign) P.C. 342.—4 pp., 1934.

With a view to preventing the introduction into the Dominion of Canada of the phony peach disease [*R.A.M.*, xiii, p. 38], the importation is prohibited as from 9th May, 1934, of peach or nectarine trees or roots or any kinds or varieties of trees or shrubs grafted or budded on such roots from the United States of America, unless each consignment is accompanied by a duly authenticated certificate vouching for the absence of the disease in question from the nursery of origin and from the area within a one-mile radius of the same. Moreover, to prevent the introduction of peach yellows [ibid., xii, pp. 454, 518] into British Columbia, the importation into that province of fresh peaches, nursery stock, and fruit pits or seeds for propagation is prohibited from the States of Wisconsin, Illinois, Missouri, Arkansas, and Texas, and from all States to the east of those mentioned.

As from 9th May, 1934, the importation into the Dominion of Canada from all countries of all species and varieties of *Ulmus* and *Zelkova*, including elm logs or burls, is prohibited with the object of preventing the introduction of the Dutch elm disease [*Ceratostomella ulmi*].

In order to prevent the introduction into the Dominion of Canada of blue mould of tobacco [*Peronospora tabacina* or *P. nicotianae*: *R.A.M.*, xiii, pp. 132, 602], the importation of tobacco seed (*Nicotiana tabacum*), including all hybrids and varieties, from the Commonwealth of Australia and the United States of America is prohibited as from 9th May, 1934.

Plant quarantine import restrictions, Island of Cyprus. United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, January–March, 1934. Quarantine and other official announcements. —pp. 17–22, 1934.

A summary, based on Orders No. 1054 (13th May, 1925), 1305

(20th May, 1929), and 1421 (23rd April, 1931), is given of the plant quarantine restrictions in force in Cyprus.

Palestine import regulations.—*Cyprus Agric. Journ.*, xxix, 2, pp. 56–57, 1934.

By regulations which came into force in August, 1934, the importation of plants (other than those covered by separate restrictions) into Palestine is permitted if they are certified by an officer of the phytopathological service of the country of origin to be apparently free from disease and insect pests. Among those covered by separate restrictions some are totally prohibited. These include bananas, all species of citrus except citrus fruits from Egypt and Cyprus, tomatoes, palms (including dates and date palms), eggplants, as well as several others liable to introduce insect pests. The following are admissible if certified free from the undermentioned diseases and certain [specified] insects: maize seed (*Sclerospora graminicola*), bean seed (*Colletotrichum lindemuthianum*), seed potatoes (*Synchytrium endobioticum*, *Bacillus phytophthorus*, and *Spongospora subterranea*), cabbage and cauliflower seed (*Pseudomonas campestris*), rose, apple, quince, and pear nursery stock (*Bacterium tumefaciens*), mango (*B. mangiferae*), and fresh peaches (*Clasterosporium carpophilum*).

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 2, p. 39, 1934.

NORWAY. By a Royal Decree of 15th December, 1933, supplementary to that of 13th February, 1925 [*R.A.M.*, iv, p. 384], all potato consignments imported into Norway must be accompanied by a duly authenticated certificate vouching for the absence from the country of origin during the six years preceding the date of export of *Synchytrium endobioticum*; and further guaranteeing that the exporting country similarly admits only such consignments as satisfy the requirement indicated above.

Legislative and administrative measures.—*Internat. Bull. of Plant Protect.*, viii, 5, pp. 108–109, 1934.

URUGUAY. In accordance with the terms of a Presidential Decree of 10th January, 1934, taking effect three months after the date of issue, all consignments of potato tubers imported into Uruguay must be guaranteed to come from regions free from *Synchytrium endobioticum* and *Spongospora subterranea* and to be free from any other serious parasitic disease. *Actinomyces scabies* may be tolerated up to 5 per cent. infection of the tubers, and on these, not more than 10 per cent. of the surface. A duly authenticated certificate must also be furnished to the effect that the tubers were specially selected for seed; that the farms on which they were grown were under official supervision; and that no evidence was forthcoming of the presence in the crops of leaf roll, mosaic, or other 'degeneration' diseases.

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TAI (F. L.). **A species of Choanephora with dichotomously branched conidiophore.**—*Sinensia (Contr. Metrop. Mus. Nat. Hist. Acad. Sinica)*, iv, 8, pp. 215–224, 14 figs., 1934.

In 1933, the author collected at Nanking on decaying pods of *Dolichos lablab* a species of *Choanephora* with dichotomously branched conidiophores. When detached branches of *D. lablab* inoculated with a spore suspension of the fungus were placed in damp chambers the flowers became discoloured and covered abundantly with the typical conidiophores, but the pods, stems, and leaves remained unaffected, the fungus producing rotting only of punctured pods, and being evidently a weak parasite.

As the conidia agree closely with the description of those of *Cunninghamella manshurica* Saito & Naganishi, the author identifies his fungus with the latter which he renames *Choanephora manshurica* (S. & N.) comb. nov. and provides with a full diagnosis in Latin and English.

The morphological characters of the conidia, sporangia and their spores, and zygospores are described and figured, and there is a bibliography of 7 titles.

SINGH (U. B.). **Studies on Cercospora indica n.sp., parasitic on Cajanus indicus Spreng.**—*Indian Journ. Agric. Sci.*, iv, 2, pp. 343–360, 3 pl. (1 col.), 4 graphs, 1934.

This is a detailed account of the author's investigation of a leaf spot of pigeon pea (*Cajanus indicus*), common in Bihar and the United Provinces of India, and caused by two strains of a species of *Cercospora* considered to be new and named *C. indica*. The strains (from Allahabad and Pusa, respectively) are identical morphologically but differ in some of their cultural characteristics.

The first symptom of the disease in nature is the appearance of small, light brown, chiefly interveinal, hypophyllous spots, with dark brown centres, 1 to 2 mm. in diameter but occasionally coalescing to form irregular areas up to 15 by 5 mm. Eventually the affected leaves dry, curl up, and fall off. The fungus also occasionally causes greyish-black, elongated lesions on the petioles and stems. The inter- and intracellular hyphae form loose stromatic masses below the stomata, producing conidiophores which emerge from the latter. A creeping external mycelium is also formed on the surface of the leaves [cf. *R.A.M.*, xii, p. 246]. The conidiophores are mostly hypophyllous, dark brown when mature, simple or branched, often geniculate at the insertion of the conidia, from

28 to 168 by 3·4 to 7 μ, and with from 2 to 13 septa according to moisture conditions. Conidiophores or their pieces readily form hyphae in tap water. The conidia are hyaline to slightly greenish-yellow, multiseptate, abruptly obclavate, sometimes vermiform, very commonly constricted at the septa, from 6·8 to 129 by 3 to 5 μ (average 37 by 4 μ), with from 0 to 9 septa (mode 2). They germinated in tap water in from eight to ten hours at 30° C., but failed to germinate after about two months.

The fungus grew best in culture in alternate light and darkness, less in continuous darkness, and least in continuous light, a feature which it shares with *C. dolichi* [ibid., xi, p. 130]. It tolerated a range of relative humidities from 47 to 100 per cent. with optimum growth at saturation point. No growth occurred at 5·5° or 37·5° C., except on Richards's solution agar at the latter temperature; the optimum for growth was 27·5°. *C. indica* tolerates a wide range of P_H values (from 2·9 to 7·1), with an optimum at 6·7; grown on a modified Richards's solution of varying P_H values it always reduced the latter to 2·9. The size and septation of the spores produced were greatest at temperatures between 20° and 25° C., and sporulation was freest at 20°. No spores were formed at 10° or below. Sclerotium-like bodies were produced in very old cultures, especially on wheat straw and pigeon pea stalks. Intercalary globular chlamydospores were formed at all temperatures; in one of the strains they were dark brown with thick walls, in the other greenish-brown with thin walls.

Both strains were found to be unable to infect pigeon pea leaves when inoculated with mycelium alone, even when placed in nutrient drops. When the leaves were sprayed with a spore suspension, the incubation period lasted ten days on mature and 15 days on young leaves. On six-day-old seedlings raised in artificial culture from sterilized seeds, which were sprayed with a spore suspension, no infection occurred below 20° C. or above 32·5°, the best being at 20° to 25°. Infection took place readily both in darkness and in light. Attempts to inoculate other leguminous species were unsuccessful.

The paper terminates with a comparative table showing the morphological details of *C. indica* [an English diagnosis of which is appended] and of *C. cajani* [ibid., ix, p. 507].

BENNETT (C. W.). **Plant-tissue relations of the Sugar-beet curly-top virus.**—*Journ. Agric. Res.*, xlviii, 8, pp. 665–701, 8 figs., 2 graphs, 1934.

This is a full report of the author's investigation of the distribution of the beet curly top virus [*R.A.M.*, xiii, pp. 285, 558] in the sugar beet and in tobacco plants (*Nicotiana tabacum* and *N. glauca*). It was shown that when the virus was introduced in the water-conducting vessels of the sugar beet, it did not pass from the tracheae into cells or tissues where it could become established and produce pathological symptoms. A study of the feeding habits of the vector of the virus (*Eutettix tenella*) [loc. cit.] and the cytological examination of its punctures in the host tissues indicated that the leafhopper chiefly feeds on the leaf veins and that its mouth parts usually penetrate the phloem region, the gelatinous sheath left by it in the tissues probably sealing off all

the cells that are penetrated by the stylets outside the phloem, and thus protecting the virus from contact with the cell contents in these tissues. The exudate occurring naturally on the petioles and leaf blades of curly top beets, as well as that exuding from the cut surface of affected beetroots, was shown to have a high virus content as compared with the juice extracted from tissues containing no vascular elements, the evidence indicating that both exudates are derived largely from the phloem. When healthy beets were grafted with diseased plants no infection took place unless full union of the grafts occurred. In similarly grafted tobacco plants the earliest infections occurred on the seventh day, when the tracheal elements formed in the unions were apparently mature, the percentage of infection increasing from 27 on that day to 100 on the twelfth. Finally, in ringing experiments with *N. tabacum* and *N. glauca*, the virus passed all rings bridged by an uninterrupted path of phloem, whether internal or external, or both combined. Interruption of phloem continuity in the stems prevented the passage of the virus through the rings, except in a few cases, in which areas were found of regenerated tissue connecting the internal and external phloem through the woody cylinder.

All these results, coupled with the failure to obtain infection of the beets by introducing the virus into the parenchyma cells and the rapid inactivation of the virus in expressed juice, as well as the failure of the leafhoppers to acquire the virus from any type of parenchyma except that immediately below the crown, would indicate that the curly top virus is largely restricted to the phloem of the hosts, probably even more closely so in the two species of infected tobacco investigated than in the beet. Attempts to obtain the virus by the leafhoppers from very young beet seed gave negative results.

In a further series of experiments it was shown that the movement of the curly top virus in tobacco is relatively slow as compared with that in the sugar beet, in which at temperatures from 85° to 135° F. the virus moved downward in young seedlings a distance of 1 in. in two minutes and in larger plants a distance of 6 in. in six minutes; in tobacco the fastest movement observed was downward from the point of inoculation to a distance of 24 in. in 48 hours. The rapid movements of the virus in the beet are considered to occur evidently in the phloem, and it is suggested that they indicate a rapid translocation of plant food materials.

DE HAAN (K.). **Beschouwingen over de praktische Suikerbietenteelt. IV. Mangaan-gebrek bij Suikerbieten.** [Observations on practical Sugar Beet cultivation. IV. Manganese deficiency in Sugar Beets.]—*Meded. Inst. Suikerbietenteelt*, 5, pp. 123–127, 1934.

Since 1931 studies have been in progress on the manganese deficiency of beets [cf. *R.A.M.*, viii, p. 751; xii, p. 19; xiii, p. 10] in the Kreekerak and Völckerpolder districts of Holland. The young leaves of affected plants show a pallor of the interveinal areas on which minute white (later brown), depressed spots develop and ultimately collapse, leaving cavities of variable size. The

margins turn upwards and the tips are abnormally pointed. Newly formed leaves are healthy at first but rapidly acquire the symptoms of nutritional deficiency. In an experiment in 1933 the beet yield was increased from 53,300 to 55,400 and 56,000 kg. per acre, respectively, by spraying the plants twice (on 13th June and 17th July) with 15 kg. per hect. of a 1·9 per cent. solution of manganese sulphate and by one application to the soil (13th June) of manganese sulphate mixed with sand at the rate of 60 kg. per hect. The corresponding figures for the sugar yield were 7,660, 8,060, and 8,070 kg. per hect. There is little to choose between spraying and strewing the manganese sulphate, the former method being more economical and rapid in its action, while the latter is simpler of application and equally efficient.

In 1932 and 1933 the reclamation disease of oats [ibid., xiii, p. 324] was also completely prevented by manganese sulphate (60 kg. per hect.).

WHITE (H. L.). **The sterilization of Lettuce seeds.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 47–51, 1934.

When Golden Ball lettuce seed treated with formalin at different concentrations for various periods of time was germinated in Petri dishes no treatment that allowed germination gave efficient disinfection. As the minimum bactericidal dose is 2 per cent. for two hours, which is twelve times that which just failed to injure the lettuce seed, it is concluded that formalin treatment is unsuitable for lettuce seed disinfection. When copper sulphate solution was used, the only treatments which reduced the number of contaminated seeds to 10 per cent. of those in the controls were 2 per cent. for 1 hour, 1 per cent. for 4·5 hours, and 2 per cent. for 4·5 hours. The last appreciably reduced germination, but the other two treatments are to be submitted to further test. Although it may be possible to use copper sulphate as a seed treatment with some varieties of lettuce, the margin of safety between the minimum bactericidal dose and the maximum dose tolerated by the seed is so small that the treatment cannot be regarded as satisfactory. Other tests demonstrated that copper sulphate and uspulun at strengths which severely retarded the germination of Golden Ball were harmless to Gotte à Forcer seed; resistance to seed injury in lettuce is evidently a varietal characteristic.

Market pathology notes from Chicago.—*Plant Disease Reporter*, xviii, 4, p. 40, 1934. [Mimeographed.]

Carrots grown in New York and placed immediately after digging into cold storage showed small, depressed areas on the roots bearing the hyphae of a *Corticium*; definite clamp-connexions were noted, and the mycelium on many of the spots bore basidiospores. Favoured by storage conditions infection had taken place through the secondary roots and spread into the tap-root. *Rhizoctonia* crown rot [? *C. solani*: *R.A.M.*, v, p. 644] was also present, and sclerotia were found on a few roots, but the *Corticium* decay was much the more important trouble.

GASSNER (G.) & HASSEBRAUK (K.). **Über Spargelrost und seine Bekämpfung.** [On Asparagus rust and its control.]—*Deutsche Landw. Presse*, lxi, 18, pp. 215–216, 1 fig., 1 diag., 1934.

In this paper (which summarizes an expanded version simultaneously published in *Gartenbauwissenschaft*, viii, pp. 455–476, 1934) the writers give a semi-popular account of the life-history, symptoms, and control of asparagus rust [*Puccinia asparagi*] in Germany [*R.A.M.*, xii, p. 745], where the loss in a single year from this disease may amount to between 10 and 11 million marks. Direct measures of control gave unsatisfactory results in the writers' experiments, and the occasional favourable reports on the effects of copper-containing preparations are believed to rest on faulty observation. There is little prospect, moreover, judging by the outcome of recent investigations by the German Horticultural Association, of developing rust-resistant varieties on a commercial scale; the Washington types, resistant in the United States [ibid., x, p. 288], have proved susceptible in Germany.

In the north German asparagus plantings pycnospores are formed in profusion towards the end of May, followed during the first half of June by aecidiospores, from which the familiar brown summer (uredo) stage arises, followed by teleutosori. It is apparent that the suppression of the last-named (the sole means of overwintering of the fungus) will automatically prevent the development of the epidemic summer phases. This necessitates the destruction of the tops, special attention to which should be paid in the vicinity of young plantings. The writers are of opinion that the existing legislation against *P. asparagi* [ibid., xii, p. 336] should be revised so as to enforce the removal of the tops as early as October in all cases where they are likely to act as sources of infection in the spring. It would further be advisable to restrict the establishment of young plantings, which are essential to the initiation of epidemics, to three- or five-yearly intervals and to place all such new stands under official supervision.

NICOLAS (G.). **Sur un Alternaria parasite du Melon.** [On an *Alternaria* parasitic on Melon.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 15–17, 1934.

The author states that in 1932 Cantaloupe melons originating from Vaucluse [south France] were found on the Toulouse market to be affected with a rot caused by *Alternaria brassicae* var. *nigrescens* [*A. cucumerina*: *R.A.M.*, xi, p. 696], which rendered them unfit for human consumption. The fruit showed a number of depressed, confluent spots, several cm. in diameter, bearing fructifications of the fungus, the [ob]clavate conidia of which measured 100 to 130 by 20 to 26 μ.

LEBEDEVA (Mme L. A.). Заготовка дикорастущих съедобных грибов. [The preservation of wild edible fungi.]—116 pp., 33 col. pl., 19 figs., Плодоовощное Объедин. Ленинградского Союза Потреб. Об-в-, Научно-Консульт Бюро [Scient. Consult. Bur., Greengrocery Assoc. of Leningrad Union of Consumers' Soc.], Leningrad, 1933. [Received August, 1934].

The purpose of this small book[illegible]

to the high nutritive value of edible fungi, and to popularize their general use as a means of compensating for the acute shortage of animal food which is now felt in U.S.S.R. It gives popular descriptions of 28 of the more common and palatable species in Russia, which are illustrated by well-executed original coloured plates. A few of the poisonous toadstools are also included, so that they may be recognized and avoided. In a separate section detailed instructions are given for the collection and industrial preservation of the fungi by several different methods.

MENDOZA (J. M.) & LEUS-PALO (SIMEONA). **Lepiota americana, an immigrant edible Mushroom.**—*Philipp. Journ. of Sci.*, liii, 3, pp. 223–225, 227, 2 pl., 1934.

A technical description is given of *Lepiota americana* Peck, a mushroom possibly introduced into the Philippines on animal fodder, the edibility of which was demonstrated at the Bureau of Science, Manila. It is collected and sold in small quantities on the market.

MÜLLER (K.) & SLEUMER (H.). **Biologische Untersuchungen über die Peronosporakrankheit des Weinstockes mit besonderer Berücksichtigung ihrer Bekämpfung nach der Inkubationskalendermethode.** [Biological investigations on the *Peronospora* disease of the Vine with special reference to its control by the incubation calendar method.]—*Landw. Jahrb.*, lxxix, 4, pp. 509–576, 10 figs., 2 graphs, 1 map, 1934.

A comprehensive account, based on twenty years' practical experience of the senior writer and a survey of the relevant literature, is given of the history, biology, symptoms, economic importance, and control of the downy mildew of the vine caused by *Plasmopara viticola*.

In Central Europe the incubation period of the disease ranges from 5 to 18 days according to the weather conditions. The minimum temperature for the occurrence of an outbreak of practical significance is 12° to 13°, optimum 18° to 24°, and maximum about 30° C. A prerequisite condition for an attack is a film of moisture on the leaves, and it is stated that this may be produced by an atmospheric humidity of 70 to 85 per cent. on young, and by 80 to 100 per cent. on older foliage. Heavy falls of rain are necessary to cause primary infection [*R.A.M.*, xii, p. 198], but secondary infections may follow showers or result from the presence of mist and dew, provided the leaves remain moist for several hours round about midnight and the temperature is above 12° to 13° [ibid., x, p. 432].

The toxicity of copper-containing fungicides to *P. viticola* is discussed on the basis of recent chemical researches [ibid., xiii, p. 423 *et passim*]. Some general cultural measures calculated to reduce the incidence of downy mildew are indicated and a full description is given of the methods locally employed for forecasting outbreaks of the disease and directing spraying operations on a phenological basis. By means of the so-called 'incubation calendar' immense losses are stated to have been averted and the average two-year-yield of the Baden vineyards doubled.

A bibliography of 126 titles is appended.

L. (M.). **Actualités. Mildiou.** [Current notes. Mildew.]—*Rev. de Vitic.*, lxxx, 2086, p. 398, 1934.

Between the 10th and 20th June, 1934, vines in the south of France were severely attacked by mildew [*Plasmopara viticola*] both on the leaves and fruit clusters. Non-setting of the fruit [*R.A.M.*, x, p. 640] was conspicuous on very vigorous vines, with the result that the crop will be seriously reduced, at least in the south of France, where in the department of Var the white Uqui vines have already lost half their berries. Serious outbreaks were also reported from two localities in Algeria on the 15th June, much of the fruit being destroyed by the grey rot form of attack [ibid., xii, p. 72].

DUBAQUIÉ (J.). **Sur la dispersion des éléments actifs dans la lutte contre les cryptogames.** [On the dispersion of the active elements in the chemical control of fungi.]—*Rev. de Vitic.*, lxxx, 2086, pp. 389–397, 1934.

After lucidly discussing the various theories advanced to explain the toxic action of copper mixtures on vine mildew [*Plasmopara viticola*], the author points out that all agree in insisting on the maximum possible dispersion of the copper on the susceptible parts of the plant and on the necessity for good adhesive properties. It is not necessary to cover the parts sprayed with a continuous layer of insoluble metal particles, neither need the spots of spray contain a very high percentage of copper. The spreader used should reduce the volume of the drops to a minimum and ensure their perfect adherence to the vine. The essential factor is dispersion. He discusses particularly the advantage of dusts in which sulphate of copper is very slowly dissolved or liberated from the mixture. In these the copper content can be very low, provided it is dispersed in a form either soluble in atmospheric moisture or capable of going into fine suspension in rain or dew deposits. It is the copper itself and not any of its basic sulphates that is the important ingredient, and attention should be concentrated on improving the means of applying it so as to favour the maximum dispersion and adherence of copper on the parts exposed to attack.

RAVAZ (L.). **Chronique. Les additions aux bouillies. L'excoriose.** [Current events. Additions to mixtures. Excoriosis.]—*Prog. Agric. et Vitic.*, ci, 16, pp. 367–370, 1934.

In the first of these two brief notes the author discusses the various forms in which sulphur is added to cupric mixtures used in the simultaneous control of *Oidium* [*Uncinula necator*] and mildew [*Plasmopara viticola*] of the vine, and the best methods to ensure its incorporation in the mixtures.

In the second note some observations are reported which appear to confirm the author's previous opinion that vine excoriosis [*Phoma flaccida*: *R.A.M.*, xii, p. 420] chiefly attacks the lowermost buds on the current year's branches, and that tall training of affected vinestocks affords an effective method for the control of the disease.

There also was some evidence that excoriosis is not readily transmissible by the spores of the fungus, but that once it has entered the host tissues it is capable of remaining indefinitely in stocks trained low.

VIALA (P.) & MARSAIS (P.). **Sur la biologie du Pumilus medullae, cause du court-noué parasitaire de la Vigne.** [On the biology of *Pumilus medullae*, the agent of parasitic court-noué of the Vine.]—*Comptes rendus Acad. des Sciences*, cxcviii, 18, pp. 1557–1560, 1934.

Further studies on the causal organism of parasitic court-noué of the vine (*Pumilus medullae*) [*R.A.M.*, xiii, p. 562] have led to the conclusion that the thick-walled, unicellular, hyaline, navicular spores, narrowed at the ends and measuring 10 by 2 μ, should be regarded as spermatia. The spermogonia, without ostioles, have been found in large numbers on dying or dead vine stems in nature, occurring in longitudinal rows, sometimes closely serried, following the direction of the medullary rays. They are embedded in the phloem which is destroyed and replaced by shapeless stromatic masses.

A similar external appearance is presented by the parallel rows of pycnidia and perithecia, which are, however, rather larger and more undulate than the spermogonia. The subcylindrical, obtuse ended, unicellular, thick-walled pycnospores measured 15 by 10 μ. Brown, uniseptate conidia develop on short conidiophores arising from a blackish pseudoparenchyma on the pycnidial surface, and measure 20 by 12 μ. The inner walls of the subovoid perithecia bear numerous asci, 55 by 6 μ, occupied by unicellular, ovoid to reniform, hyaline ascospores, measuring 11 by 4 μ. The thick membrane of all these organs consists of several superimposed layers of polyhedric cells and is very hygroscopic, so that the spores are exuded through fissures in the walls in immense numbers on immersion in water. All the spores—spermatia, pycnospores, and ascospores—germinate readily and reproduce the characteristic mycelium of *P. medullae*.

This new genus of Ascomycetes belongs to the family of Sphaeriaceae near *Xylaria* and *Eutypa*. [This paper also appears in *Comptes rendus Acad. d'Agric. de France*, xx, 15, pp. 515–519, 1934 and *Rev. de Vitic.*, lxxx, 2079, pp. 277–279, 1934.]

Fungus and other diseases of crops 1928–1932.—*Min. of Agric. & Fish. Bull.* 79, 117 pp., 8 pl., 1 map, 1934.

The information contained in this bulletin (compiled jointly by G. H. Pethybridge, W. C. Moore, and A. Smith) is stated to be based mainly on the monthly reports on the incidence and severity of crop diseases received at the Ministry's Plant Pathological Laboratory from the advisers in mycology in the 14 administrative provinces (reduced to 13 in October, 1932) of England and Wales [cf. *R.A.M.*, ix, p. 287].

Among the new records of special interest the following may be mentioned. *Bacterium marginatum* was isolated from imported gladiolus corms [ibid., xii, p. 356] in 1929, the scab or neck rot for which it is responsible being subsequently observed in the field in

Surrey, Sussex, and Norfolk. In 1930 *Oidium hortensiae* [*Microsphaera polonica*: ibid., xiii, p. 655] developed on hydrangeas in Warwickshire. Glasshouse potatoes at Cambridge were severely attacked in 1932 by the oidial stage of a powdery mildew, possibly *Erysiphe cichoracearum* [cf. ibid., vi, pp. 59, 714; vii, p. 534; xi, p. 226]. *Kunkelia nitens*, detected in 1931 on three Lucretia dewberry [*Rubus flagellaris*] plants [ibid., xi, p. 423], was successfully eradicated by burning the diseased individuals and their immediate neighbours. Slight infection of beet leaves by *Ascochyta betae* [ibid., x, p. 425] was observed in Devon in 1928. *Fusarium tuberculariodes* caused leaf spotting of tulips in Devon in 1931–2 and in the latter year also in Cornwall. Carnations in Middlesex were affected in 1932 by a basal leaf and stem rot associated with the presence of *Colletotrichum herbarum*. Lily (*Lilium umbellatum*) foliage in Sussex developed a brown spotting due to *Kabatiella microsticta* in 1930 [ibid., x, p. 583]. *Sclerotium delphinii* [ibid., xiii, p. 99] was responsible for heavy losses among bulbs of the last-named host imported from Japan in 1929, and caused slight damage to English iris bulbs in Buckinghamshire in 1932.

WORMALD (H.). **Notes on plant diseases in 1933.**—*Ann. Rept. East Malling Res. Stat. 1st Jan. 1933 to 31st Dec. 1933*, pp. 142–146, 1934.

This account of plant diseases investigated at the East Malling Research Station, Kent, in 1933 [*R.A.M.*, xii, p. 487] contains, among others, the following items of phytopathological interest.

A Morello cherry twig bore a young shoot girdled by a lesion in the middle of which was a node with a withered leaf showing the fructifications of *Botrytis cinerea* [ibid., viii, p. 153], the evidence indicating that the fungus had extended into the shoot after infecting the leaf.

Very severely blistered apple twigs and stems were received from Sussex and Essex, respectively, but though the condition is constantly associated with *Coniothecium chomatosporum* [ibid., xi, p. 51], experiments have hitherto failed to establish the parasitism of this fungus.

In one instance, raspberry canes were found to bear fruits the majority of which were worthless owing to attack by *Sphaerotheca humuli* [ibid., xii, p. 678]. Loganberry fruits also showed a similar spotting, the same fungus being present on the spots.

POLLACCI (G.). **Rassegna sull' attività del Laboratorio Crittagamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1933.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia, and Piacenza) during the year 1933.] —*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 3–23, 1934.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiii, p. 150], a summary is given of the work carried out in 1933 at the Cryptogamic Laboratory, Pavia, followed by a list (arranged under hosts and including a very large number of human and animal pathogens) of the diseases identified during

the year. Much of the information given has already been noticed from other sources [cf. ibid., xiii, pp. 209, 268, 384, 511, 547].

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Twenty-eighth Ann. Rept. Dept. of Agric. British Columbia for the year 1933*, pp. Y 32–Y 38, 1934.

Details are given of further comparative experiments with different fungicides against apple scab [*Venturia inaequalis*] in the West Kootenay district of British Columbia [*R.A.M.*, xii, p. 678], from which it appears that adequate control is given in normal seasons on all but the most susceptible varieties by properly timed applications of lime-sulphur 1 in 80 or a mixture of lime-sulphur (½ gall.) and calcium monosulphide (3½ lb.) in 40 galls. water. A considerably more effective but also more expensive mixture consists of 10 lb. ferrous sulphate powder, 2½ galls. lime-sulphur, and 5 lb. calcium arsenate (4 lb. for calyx and later applications).

A hitherto unidentified fungus was isolated from the small, brown, firm, rotted areas round the calyx end of Cox's Orange and Rome Beauty apples in the Queens Bay district, where losses up to 5 per cent. from this source have been recorded.

During 1932–3 the following wheat varieties proved immune from bunt [*Tilletia caries*: ibid., xiii, p. 86] in artificial inoculation tests at the Saanichton Experimental Station: Albit, Ridit, Oro, Jen. × Ridit, White Odessa, Martin, and Hussar. Resistance was shown by Dawson's Golden Chaff, Sun, Golden Sun, Berkeley Rock, Kharkov, Minhardi, and Yeoman, whereas Imperial Amber, A.O.C. 104, and Crail Fife were moderately susceptible and Hybrid 128 highly so.

NARASIMHAN (M. J.). **Report of work done in the Mycological Section during 1932–33.**—*Admin. Rept. Agric. Dept. Mysore for the year 1932–33*, pp. 53–56, 1934.

During the year ending 30th June, 1933, materials sufficient to spray about 9,450 acres of areca palm [*Areca catechu*] against koleroga [*Phytophthora arecae*: *R.A.M.*, xiii, p. 77] were supplied to growers in Mysore, the total transactions amounting to Rs. 24,142 [about £1,800].

Of 11 areca palms inoculated with the 'anaberoga' organism 5 became infected, 2 others showed root discoloration, and 2 developed yellowing of the crowns. In another experiment five months after tying the inoculum to two roots from which an outer piece had been removed, one was dry, friable, discoloured, and contained the fungus in the tissues, while the end of the other still attached to the tree had rotted.

The fungus causing coco-nut anaberoga [*Ganoderma lucidum*: ibid., xii, p. 76] formed sporophores in culture.

Good results in the control of mildew [? *Oidium* sp.: ibid., ix, p. 765] of betel [*Piper betle*] were obtained by spraying with Bordeaux mixture (½ per cent.) with casein, 1 per cent. oolite sulphur, emulsions of hongé [*Pongamia glabra*] or castor soap and 0·5 per cent. gingelly [*Sesamum indicum*], groundnut, or *P. glabra*

oil, and ½ per cent. Bordeaux mixture with 1 per cent. of the same oils [cf. ibid., xiii, p. 573].

Spraying against *Alternaria* disease of potatoes [*A. solani*: ibid., xiii, p. 78] has proved to be less popular than was anticipated. Plots sprayed with ½ per cent. Bordeaux mixture when the crop was about 30 days old and again a month later gave an increased yield of 20 lb. per gunta over the unsprayed control plots. Spraying with calcium arsenate (1 lb. in 50 galls. water) checked infection.

The flowers of the susceptible varieties H2, H22, H40, and Local Hullubele of ragi [*Eleusine coracana*] in pots were artificially inoculated with smut [*Ustilago eleusinis*: ibid., xi, p. 158] on three consecutive days in November, 1932; seeds from each were sown in pots in January, 1933, but no smut resulted.

Other records include *Pythium de Baryanum* on chilli fruits [*Capsicum annuum*], *Entomophthora aphidis* [ibid., viii, p. 779] on aphids infesting vegetables, *Rhizoctonia* sp. on soy-bean, and species of *Fusarium* on cotton and plantains [*Musa paradisiaca*].

PLYMEN (F. J.). **Reports on the working of the Department of Agriculture of the Central Provinces for the years ending the 31st March 1932 and the 31st March 1933.**—40 pp., 1933. [Received September, 1934.]

The following references of phytopathological interest occur in this report. The seedling blight of cotton caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, xi, pp. 104, 221, and below, p. 697] was found in 1931–2 to be more severe in late than in normally germinating seedlings, and also in fields where the crop was sown early in dry soil. Anthracnose [*Colletotrichum indicum*: ibid., xiii, p. 508] caused heavy damage on early bolls and on the lint and seed of the first picking. *Gossypium* [*neglectum*] *verum* 262 proved more susceptible both to seedling blight and anthracnose than *G.* [*n.*] *roseum*, and in 1932–3 the latter outyielded the former on the Akola farm by 23 per cent. on account of its superior resistance to these diseases.

The linseed selection E.B. 3 combines desirable constitutional characters with resistance to rust [*Melampsora lini*], an important factor locally in reducing the yield of this crop. Satisfactory results have been given by crosses between E.B. 3, and the local and Punjab linseeds and Irish flax, both in respect of yield and rust resistance.

In a series of inoculation experiments on 72 cultures of pigeon pea (*Cajanus indicus*) at Nagpur in 1931–2 with the wilt organism [*Fusarium vasinfectum*: ibid., xiii, p. 345], the incidence of infection ranged from 3 to 94 per cent. Attention is now being concentrated on the development of resistant strains, i.e. those showing not more than 25 per cent. infection. Strain No. 3 having already given satisfactory results, arrangements were made for its multiplication and distribution.

The highest yield of gram (*Cicer arietinum*) was obtained in 1931–2 from a hybrid between the wilt [? *Fusarium*: ibid., ix, p. 10] resistant Cawnpore type and the best local selection No. 98

In 1932–3 the Cawnpore and Karachi types maintained their wilt-resistant qualities.

Copper carbonate has been found considerably more effective, but also more expensive, than sulphur in the control of sorghum smut [*Sphacelotheca sorghi*: ibid., xi, p. 103].

[Mitra (S. K.).] **Appendix IV. Mycology.**—*Ann. Rept. Dept. of Agric., Assam, for the year 1931–2*, pp. 51–52, 1933. [Received September, 1934.]

Notes are given on the incidence and control of a number of well-known diseases of economic crops in Assam, India, during 1931–2.

Report on the Agricultural Department, Dominica, for the year ended 31st December, 1933.—*Trinidad, Imper. Comm. of Agric. West Indies*, 25 pp., 1934.

The following references of phytopathological interest occur on pp. 5, 6, and 10 of this report. Efforts to obtain a lime combining resistance to wither-tip [*Gloeosporium limetticolum*] with the superior qualities of the West Indian lime have been continued [*R.A.M.*, xii, p. 22]. It is estimated that some 1,500 acres have been planted with limes budded on disease- and hurricane-resisting stocks.

An examination at the Imperial College of Tropical Agriculture of diseased 'cocoye' (*Musa* sp.) plants from a northern estate indicated that *Bacterium solanacearum*, the agent of 'moko' disease [ibid., x, p. 472 and below, p. 713] was responsible. Susceptible banana varieties include Dwarf or Cavendish, Red, Giant Fig, and Moko (Bluggoe of Grenada).

Fifty-second Annual Report of the Ohio Agricultural Experiment Station 1932–1933.—*Ohio Agric. Exper. Stat. Bull.* 532, 112 pp., 7 figs., 3 diags., 5 graphs, 1 map, 1934.

In the section of this report [cf. *R.A.M.*, xii, p. 356] on botany and plant pathology (pp. 33–38), Young states that the spring of 1933 was the first season when the spray service considered it useful to recommend the application of three pre-blossom sprays for the control of apple scab [*Venturia inaequalis*], owing to the prolonged period of spore discharge by the fungus induced by frequent rainy periods. He also briefly mentions tests of several copper compounds for the purpose of finding a safe substitute for Bordeaux mixture which frequently causes considerable spray injury in Ohio, particularly to the fruit, at practically all strengths; one form of basic copper chloride gave good control of scab, and caused much less injury than the regular copper sprays or dusts; it is considered to be sufficiently promising to warrant further trials.

With reference to the continued campaign against raspberry diseases [loc. cit.], Young and Winter state that the results so far obtained indicate that practically disease-free plantations can be maintained by careful inspection and roguing from year to year. This is well illustrated by the fact that the average of 20 black raspberry [*Rubus occidentalis*] plantings from 2 to 8 years old,

belonging to growers who have co-operated in the scheme, gave less than 0·25 per cent. total virus diseases and less than 0·1 per cent. crown gall [*Bacterium tumefaciens*], as compared with anything from 5 to 100 per cent. total disease found in ordinary plantings in the State.

According to Wilson, continued varietal tests of celery for resistance to celery yellows [*Fusarium* sp.: loc. cit.] showed Columbia (which belongs to a group of resistant varieties) to have been the most resistant of the varieties tried in 1933. Early Fortune, Golden Plume, Newark Market, and Wonderful gave 20, 28, 29, and 29 per cent. disease, while Golden Phenomenal, Hoover's Special, and Golden Self Blanching were 75, 76, and 83 per cent. diseased, respectively.

Alexander states that a source of resistance to tomato leaf mould [*Cladosporium fulvum*: ibid., xii, p. 250] was offered by an off-type tomato plant which was found in a greenhouse in the spring of 1930; it was crossed with the varieties Marhio and Globe, and 23 F_5 selections of these crosses are pure lines for complete resistance to the disease but produce fruit which is too small and lacking in quality for commercial usage; good increase in size of fruit has, however, been obtained by crossing the original hybrids with commercial varieties.

In a brief report on maize seed-grain treatment for the control of Stewart's wilt disease (*Phytomonas* [*Aplanobacter*] *stewarti*) [ibid., xiii, p. 298], Thomas states that in greenhouse tests hot water treatment at 52° C. for 10 minutes reduced the percentage of disease to 5·3, as against 30·6 in the controls, while steeping pre-soaked grain in 1 in 180 formaldehyde for three hours gave complete control of the disease.

May reports that as a result of an extensive investigation of the pine canker found some two years ago in Ohio, the cause of the disease has been tentatively identified as *Atropellis pinicola*, a fungus which was described as a minor parasite of western white pine [*Pinus monticola*] in the Pacific Northwest [ibid., ix, p. 815]. This fungus has now been collected on eastern white pine [*P. strobus*], and it may serve as an example of an organism native to, and of little importance in, one area of the country, assuming considerably greater importance when introduced into another region.

FAWCETT (G. L.). **Departamento de Botánica y Patología Vegetal.** [Department of Botany and Plant Pathology.]—*ex* **Memoria Anual del Año 1932** [Annual Report for the year 1932.]—*Rev. Indust. y Agric. de Tucumán*, xxiii, 11–12, pp. 243–247, 1933. [Received September, 1934.]

The white, transverse stripes, similar to those induced by cold, previously observed on sugar-cane leaves in Tucumán, Argentine Republic [*R.A.M.*, xii, p. 786], were found to develop as a result of exposure of the buds to a temperature range of 35° to 49° C. for periods of 1 to 4½ hours. The effects of exposure to heat thus simulate those attributed to low temperature; they are purely transitory, the bleached portions being rapidly shed.

Some of the new local cane varieties developed another type of spotting of obscure origin, consisting of small, reddish, circular

lesions completely covering the leaves and causing premature desiccation. Inoculation experiments with the juice of diseased foliage on P.O.J. 36 and 213 gave negative results.

It was established by cross-inoculation experiments that the 'corcova' ['hunchback'] disease of tobacco [ibid., xi, p. 269] is identical with a disease commonly affecting tomatoes in the spring. Tobacco inoculated from diseased tomatoes developed characteristic symptoms of corcova and vice versa. This disorder is stated to be a limiting factor in tobacco cultivation under local conditions.

Citrus leaves from Paraguay were found to bear lesions resembling those of canker [*Pseudomonas citri*], but on examination at the United States Department of Agriculture the disease was stated to be not canker but one which the Department had not previously seen and which appeared to be unknown elsewhere [cf. ibid., xiii, p. 437].

LEEFMANS (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch Oost-Indië in 1931.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1931.]—*Meded. Inst. voor Plantenziekten*, 82, 92 pp., 1934.

The following are among the numerous interesting items contained in this report, prepared on the usual lines [*R.A.M.*, xii, p. 425]. Red root rot (*Ganoderma*) [*pseudoferreum*] has been definitely ascertained to occur on *Cinchona* in Central Java [ibid., ix, p. 161].

Coryneum myristicae was again responsible for serious financial losses in the nutmeg crop in Central Java, up to 50 per cent. of the fruits bursting before ripening, of which only a portion can be marketed as low-grade produce. A species of *Phytophthora* [ibid., xii, p. 425] attacked the stems of nutmeg trees but was adequately controlled in most cases by excision of the diseased tissues and painting with carbolineum.

Yellow spot [*Cercospora kopkei*: ibid., xi, p. 205] was the most important disease of sugar-cane in East Java [ibid., xiii, p. 654], where the susceptible P.O.J. 2878 variety is extensively cultivated. Leaf scald [*Bacterium albilineans*: loc. cit.] occurred sporadically in young stands, chiefly in Central Java, where the so-called 'fourth disease' was also present on P.O.J. 2878 and 2691; the last-named disorder appears to be transmissible through the setts. Pokkah-boeng (*Fusarium*) [*Gibberella moniliformis*: ibid., x, p. 751] was reported from East and West Java (where it is considered to be a contributory factor to the low standard of production), as well as from the Cheribon Subdivision of the Java Sugar Industry Experiment Station. The insignificant early occurrence of the disease developed in the last-named district into a severe and extensive top rot. The P.O.J. 2691 variety appears to be more susceptible to pokkah-boeng and red stripe [*Phytomonas rubrilineans*: ibid., xi, p. 327] than P.O.J. 2878. The so-called 'kalimati' disease [ibid., xii, p. 425] and 'spotty chlorosis' occurred locally in East Java.

'Spikkel' [leaf spot] of tobacco (*Cercospora nicotianae*) [ibid., xiii, p. 328] was prevalent in the Vorstenland, even on black dust ('zwarte stof') soils. In Besoeki a new disease, apparently caused

by a species of *Pythium*, caused heavy damage in some tobacco seed-beds.

Asterina camelliae was reported from Sumatra as the cause of a new leaf disease of tea. In the Patjet district of Java some 50 per cent. of the potato crop was affected by slime disease [*Bacterium solanacearum*], contracted both through contaminated seed from Bandoeng and from the soil.

Root rot [ibid., x, p. 298] was the most serious disease of rice in the Kedoe Residency, where a total area of 2,010 hect. was affected, the corresponding figures in Bodjonegoro and Besoeki being 18,516 and 700 hect., respectively.

The vanilla disease caused by *Gloeosporium* sp. [ibid., xiii, p. 58] in Kedoe was held in check by the application of Bordeaux mixture.

A species of *Diplodia* was identified at the Phytopathological Institute as the probable cause of the rotting and shedding of coco-nuts observed for the first time in 1931 on the west coast of Sumatra, where the number of affected palms increased from 3 in April to 200 in August. The diseased nuts could not be used for copra.

Pepper [*Piper nigrum*] in West Borneo suffered from a foot rot due to a species of *Phytophthora* which caused losses of up to 10 per cent. in certain plantations.

Black root rot (*Rosellinia bunodes*) was widespread in a Besoeki estate on *Desmodium gyroides*.

Mouldy rot (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*] of *Hevea* rubber is stated to be no longer of any importance in Java except in the south of the east coast plantations and in Tapanoeli. Red root rot (*Ganoderma pseudoferreum*) caused severe damage on old rubber estates in Central Java.

Coffee was extensively attacked in Central Java by *Corticium javanicum* [*C. salmonicolor*: ibid., xi, p. 432], which also occurred in Malang, especially in densely planted areas.

MYERS (J. G.). **Observations on a journey from the mouth of the Amazon to Mt. Roraima and down the cattle-trail to Georgetown.**—*Agric. Journ. Brit. Guiana*, v, 2, pp. 86–100, 1934.

In this account of a journey made in 1932 in the Amazon basin under the auspices of the Imperial Institute of Entomology, the Empire Marketing Board, and the Trinidad Sugar-Cane Investigation Committee the author states that near Pará and also along the main course of the Amazon almost as far up as Manãos cacao was heavily infected with witches' broom [*Marasmius perniciosus*: *R.A.M.*, xiii, p. 359], apparently not previously recorded from the Amazon region. In the Kanuku mountains true wild cacao (of exactly the same uniform type as the wild cacao seen by the writer on an affluent of the Coppername River in Surinam) was apparently completely unaffected by this disease.

The *Hevea* rubber nurseries, containing two and a half million seedlings, at Boa Vista, the settlement on the Ford rubber concession on the Rio Tapajoz, an affluent on the right bank of the Amazon, were affected by a troublesome leaf disease. The

settlement, begun only five years previously, already has 4,500 acres of thriving rubber trees planted out.

LUDWIGS (K.). **Hexenbesen an Kakaobäumen.** [Witches' brooms on Cacao trees.]—*Der Tropenpflanzer*, xxxvii, 5, pp. 198–203, 2 figs., 1934.

In 1933 the writer investigated the so-called 'witches' broom' disease of cacao (attributed by v. Faber in 1908 to *Taphrina bussei*) [*R.A.M.*, xii, p. 207]) in the Cameroons. The disturbance, which is quite distinct from the South American witches' broom due to *Marasmius perniciosus* [see preceding abstract], is characterized by a generalized malformation of the entire crown, the periphery of which is particularly conspicuous by reason of the dense foliage. The condition would appear to be due rather to adverse physiological factors than to parasitic agency, and should be designated 'intensive or over-branching' in preference to 'witches' broom'. During 1933 weather conditions in the Cameroons were abnormal, the customary late winter to early spring drought being interrupted by excessively heavy rains, inducing premature growth. These were followed in March and April by an extremely dry spell, arresting development and causing extensive shedding of flowers, fruit, and foliage. The succeeding rainy period in May in its turn stimulated fresh growth and led to superfluous bud formation with the above-mentioned results. Cacao in the Ekona plantation showed a specially marked tendency to over-branching. The disorder is considered unlikely to cause any direct injury to the trees, which may, however, eventually suffer from exhaustion due to over-production.

OSTERMAYER (A.). **Statistische Studien über das Auftreten und die Bekämpfung von Pflanzenkrankheiten.** [Statistical studies on the occurrence and control of plant diseases.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xii, 3, pp. 61–71, 1934.

Statistical analyses, based on an evaluation of the relative importance of various environmental factors in the occurrence of plant diseases, were made from 1903–11 and again from 1917–32 on the incidence of cereal disorders in different parts of Austria, Czecho-Slovakia, and Hungary. During the first and second observation periods, respectively, 451 and 647 stands were inspected.

The first analytical data revealed the epidemic character of the cereal diseases on the farms visited in Moravia, where only 13·7 per cent. of the 451 stands could be classified as completely sound, the corresponding figures for slight, severe, and mass infection being 26·8, 39, and 20·5 per cent., respectively. From a consideration of the relative influence on disease of place of cultivation (approximation to, or deviation from, the 'ecological optimum'), climate, soil, and crop rotation it was found that these factors are operative in the order named. A site approaching the ideal is, therefore, the prerequisite condition for healthy growth. The subsidiary but yet important rôle of cultural measures in the promotion or prevention of disease is discussed with special reference

to blackleg and lodging of wheat [*Ophiobolus graminis* and *Cercosporella herpotrichoides*: *R.A.M.*, xiii, p. 569]. In confirmation of German observations the former disturbance appears from the writer's investigations to occur primarily on the lighter types of soil poor in certain nutrient elements, whereas the latter is more prevalent on richer ground. On both diseases a decisive influence is exercised by crop rotation, their incidence being lowest after black fallow and relatively slight following clover or beet. It is of the utmost importance that one of the two last-named, or some other legume or root crop, should be interposed between any cereal (more especially barley) and wheat. Contrary to statements in the literature, oats were found to be more detrimental than rye to the succeeding wheat crop [cf. ibid., xiii, p. 154].

BEVER (W. M.). **Physiologic specialization in Puccinia glumarum in the United States.**—*Phytopath.*, xxiv, 6, pp. 686–688, 1934.

Apart from the work of Hungerford and Owens [*R.A.M.*, iii, p. 266], there has been little or no evidence of more than one physiologic form of *Puccinia glumarum* in the United States until 1933, when the Red Russian wheat variety (C.I. 5409), which has always been immune from the form commonly present at Moscow, Idaho, showed susceptibility to the form prevailing in the Flathead Valley of Montana. Some months later a number of the wheats used by Gassner and Straib in their determination of physiologic forms of *P. glumarum* in Europe, together with some American wheat and emmer varieties, were inoculated with the Montana and Moscow forms under controlled conditions. Both Red Russian and Chinese 166 were found to differ from the remaining varieties in their reactions [which are tabulated] to the two collections of *P. glumarum*, being resistant to the Moscow form and susceptible to that from Montana. The latter is, therefore, believed to be a distinct physiologic form observed for the first time in the United States.

SIBILIA (C.). **Sulla costituzione biotipica della Puccinia triticina Erikss. in Italia.** [On the biotypical constitution of *Puccinia triticina* Erikss. in Italy.]—*Rendic. R. Accad. Lincei*, xix, Ser. VI, 1, pp. 53–55, 1934.

Two Italian collections of brown rust of wheat (*Puccinia triticina*), one from the Gran Sasso (1,300 m. above sea level) and the other from Rome, were shown by inoculation experiments on eight standard varieties to correspond to Scheibe's physiologic form XV [*R.A.M.*, xii, p. 619; xiii, p. 619].

SĂVULESCU (T.). **Die Beeinflussung der spezifischen Widerstandsfähigkeit und Empfänglichkeit des Weizens gegen Rost durch die Wirkung der äusseren Faktoren.** [The action of external factors as influencing the specific resistance and susceptibility of Wheat to rust.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 6, pp. 257–309, 33 graphs, 1934.

No consistent inferences can be drawn regarding the influence of soil reaction on the occurrence and spread of brown rust of wheat (*Puccinia triticina*) from the author's investigations in Rumania [*R.A.M.*, xiii, p. 152]. In a general way, wheat is not

liable to this disease on neutral or alkaline soils, yet in 1932 it was just under such conditions that the rust attained its maximum severity and extent. In years of heavy precipitation (e.g., 1932), certain types of sandy soils that have a relatively high water-holding capacity are much more favourable to rust outbreaks than those of the dark forest type [cf. ibid., xiii, p. 83]. Prolific tillering, which may be induced by thorough autumn tillage, is an important means of reducing the incidence of *P. triticina*. Careful studies since 1928 of the so-called 'thermohydric factor', i.e., the combined effect on brown rust of temperature and moisture, have shown the significance of meteorological conditions during the critical phase of growth on the reaction of wheat plants to *P. triticina* ('thermohydric predisposition index'). Thus, the greater the number of rainy periods with coincident reduction of temperature during May and June, the higher will be the incidence of brown rust. Neither temperature nor moisture alone, however, is capable of modifying the reaction to brown rust in this manner.

TRAAEN (A. E.) & JØRSTAD (I.). **Kornavsopningsforsøk med kjemikalier i årene 1930–33.** [Seed-grain disinfection experiments with chemicals during the years 1930–33.]—Reprinted from *Meld. Statens frøkontroll i År 1932–33*, 24 pp., 1934. [English summary.]

The results are fully described and tabulated of experiments carried out in Norway from 1930–3 on the control by numerous liquid and dry disinfectants of wheat bunt (*Tilletia caries*), covered smut of barley (*Ustilago hordei*), oat smuts (*Ustilago kolleri* and *U. avenae*), and barley stripe (*Helminthosporium gramineum*), and notes on seed injury are given [cf. *R.A.M.*, ix, p. 638].

FRON (G.). **Nouveau essais de lutte contre la maladie du piétin du Blé.** [New attempts at the control of the foot rot disease of wheat.]—*Comptes rendus Acad. d'Agric. de France*, xx, 19, pp. 644–650, 1934.

In a recent test wheat (Bon Fermier) seed-grain dusted with neutral sulphate of ortho-oxyquinoline and subsequently inoculated with *Cercosporella herpotrichoides*, the chief agent of foot rot in France [*R.A.M.*, xii, p. 685; cf. also xiii, pp. 623, 626], produced a good, thick stand with few gaps, whereas the plots raised from infected, non-dusted seed-grain were practically destroyed by the disease. The spores of *Tilletia tritici* [*T. caries*] are unable to germinate in a solution of 1 in 1,000,000 oxyquinoline, the use of which against bunt is therefore also indicated.

SPRAGUE (R.). **The association of Cercosporella herpotrichoides with the Festuca consociation.**—*Phytopath.*, xxiv, 6, pp. 669–676, 2 figs., 1934.

The writer's investigations on the ecological associations of the foot rot of winter wheat and winter barley caused by *Cercosporella herpotrichoides* in certain prairie areas of Washington, Oregon, and Idaho [*R.A.M.*, xiii, p. 433 and preceding abstract] have shown that the fungus is almost exclusively confined to regions that originally bore a *Festuca* sod-grass consociation. Indicator plants

include *F. idahoensis* (dominant), bunch grass (*Agropyron* spp.), *Balsamorhiza* sp., *Delphinium menziesii*, *Lomatium* [*Peucedanum*] *triternatum*, and *Lithospermum ruderale* [*L. pilosum*].

RUTTLE (MABEL L.) (Mrs. NEBEL). **Studies on Barley smuts and on loose smut of Wheat.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 221, 39 pp., 6 figs., 1934.

The examination of field and greenhouse collections of barley smuts from various parts of the United States and from Canada during the period from 1931 to 1933 showed the existence of five types [a brief description of which is given] intermediate between *Ustilago hordei* and *U. nuda*, of which type 4 corresponded closely to *U. medians* Biedenkopf (*Zeitschr. f. Pflanzenkr.*, iv, pp. 321–322, 1894) and *U. nigra* [*R.A.M.*, xii, p. 161]; types 2 and 3 were intermediate between type 4 and *U. hordei*, and types 5 and 6 intermediate between type 4 and *U. nuda*. In artificial inoculation experiments, Alpha barley was infected by all the smut collections that were tested, but Featherston barley was not infected by certain type 4 collections, and Tennessee Winter barley by *U. nuda* collected on Featherston in the greenhouse; in the same experiments, no infection was obtained on Reward wheat with *U. tritici* collected on Honor wheat in the greenhouse at Geneva, New York, nor on Honor with *U. tritici* collected on Garnet wheat in Manitoba (Reward form).

Details are further given of experiments in which type 3 smut was hybridized with *U. hordei* by inoculating dehulled barley seed with a monosporidial culture of each, belonging to the two sex groups found to be present in the sporidia isolated, and seed-grain obtained from flowers inoculated with *U. nuda* was inoculated with different bisporidial cultures of *U. hordei* or type 3. In describing the various types of infection which resulted in the plants of the latter series, mention is made of two plants from one culture, the heads of which contained, besides spores typical of *U. nuda* and type 3, other spores which were echinulate but germinated by promycelia and sporidia, and are suspected to be hybrid spores between type 3 and *U. nuda*.

Barley grain obtained from flowers inoculated with type 4 was not penetrated by the mycelium of the smut, and the resting sporidia and hyphae which developed on the surface of the caryopsis produced sporidia within 24 hours after the grain was put to germinate. Abundant mycelium, however, was present in the grains of Alpha and Featherston barleys which were obtained by flower inoculation with *U. nuda*, and in those of Honor and Reward wheats similarly inoculated with their own forms of *U. tritici*.

SPARROW (F. K.). **The occurrence of true sporangia in the Physoderma disease of Corn.**—*Science*, N.S., lxxix, 2060, pp. 563–564, 1934.

Physoderma zeae-maydis, the agent of brown spot of maize in the south-eastern United States [*R.A.M.*, xiii, pp. 225, 628], has recently been found by the writer to produce an abundance of thin-walled, irregular, extramatrical sporangia furnished with an intramatrical rhizoidal system. These organs, rather than the

thick-walled, brownish, elliptical or flattened intramatrical structures usually termed 'sporangia', are believed to correspond more exactly with the sporangia formed by certain other members of the Chytridiales.

If the zoospores developing from the thick-walled resting spores are placed with a piece of an unfolding maize leaf (Golden Bantam in these tests) in a hanging drop culture, many develop after three days into irregular, slipper-shaped structures anchored to the host cell by a coarse, branched, rhizoidal system arising from a small apophysis. At maturity a number of zoospores, sometimes exceeding 300, are produced within the sporangium thus formed from the body of the original zoospore and are eventually discharged through a broad pore formed after the deliquescence of a single apical papilla. These spores resemble those produced by the germinating resting spores but are much smaller (? gametes). Similar sporangia have been observed to occur in *P. menyanthis*, *P. butomi*, and *P. maculare*.

LÉVY (JEANNE) & BOGDANOVIČ (S. B.). **Sur quelques propriétés pharmacodynamiques d'Ustilago maidis.** [On some pharmacodynamic properties of *Ustilago maidis*.]—*Comptes rendus Soc. de Biol.*, cxvi, 22, pp. 590–592, 1 graph, 1934.

It was shown by experiments on laboratory animals that *Ustilago maidis* [*U. zeae*], either in the form of a 10 or 20 per cent. macerated solution or in that of a fluid extract, is capable of modifying the pharmacodynamic properties of adrenalin, diminishing its vasoconstrictive renal action and transforming its inhibitory influence on the intestinal functions into a stimulatory one [cf. *R.A.M.*, xiii, p. 225]. Up to a certain point, therefore, the properties of *U. zeae* may be regarded as comparable to those of ergot of rye [*Claviceps purpurea*: ibid., xii, p. 88].

FAWCETT (H. S.). **Is psorosis of Citrus a virus disease?**—*Phytopath.*, xxiv, 6, pp. 659–667, 3 figs., 1934.

An extended description is given of the writer's observations in California suggesting a virus origin for citrus psorosis, a summary of which has already been noticed from another source [*R.A.M.*, xiii, p. 90]. The spots on the young leaves may be up to about 3 mm. long by ½ to 1 mm. broad, while those sometimes seen on the older foliage are larger (up to 6 or even 10 mm. in diameter) and more circular. The bark of water sprouts occasionally shows spots resembling this last type. It is suggested that the virus may occur in either a localized or systemic form. Rooted leafy shoots from trees with severe psorosis gave plants with mottled foliage, while those similarly grown from healthy trees had normal leaves.

PARKER (E. R.). **Effect of certain zinc sulphate sprays for mottle leaf of Citrus.**—*California Citrograph*, xix, 8, p. 204, 3 figs., 1934.

In further spraying tests against citrus mottle leaf in California [*R.A.M.*, xiii, p. 573] serious injury, including severe defoliation with leaf and fruit spotting, and death of the terminal buds, was

caused when navel and Valentia orange, lemon, and grapefruit trees were sprayed with zinc sulphate (5 to 20 lb. in 100 galls. water) without lime, but no damage resulted when the mixture used consisted of 10 lb. zinc sulphate and 5 lb. hydrated lime in 100 galls. water.

CARDOSO (J. G. A.). **Mozambique: diseases and pests of Citrus in the district of Lourenço Marques.**—*Internat. Bull. of Plant Protect.*, viii, 6, p. 126, 1934.

Citrus canker (*Phytomonas* [*Pseudomonas*] *citri*) was not observed in the course of a phytosanitary inspection of the plantations in the Lorenzo Marquez district of Mozambique [*R.A.M.*, xiii, p. 544]. The following fungi, however, are responsible there for diseases requiring treatment: *Capnodium citri*, *Colletotrichum gloeosporioides*, *Pythiacystis* [*Phytophthora*] *citrophthora* [ibid., xiii, pp. 437, 630], *Rosellinia* sp., and *Sporotrichum citri* [ibid., xiii, p. 90].

BITANCOURT (A. A.). **Stomiopeltis citri n.sp., agente da 'fuligem' dos Citrus no Estado de São Paulo.** [*Stomiopeltis citri* n.sp., the causal agent of 'sooty blotch' of Citrus in the State of São Paulo.]—Reprinted from *Arq. Inst. Biol. de Defesa Agric. e Animal*, São Paulo, v, 12 pp., 2 pl., 1934. [English summary.]

This is a detailed morphological and taxonomic account of a fungus, considered to be new to science, which causes sooty blotch on citrus green shoots, leaves, and fruits in the State of São Paulo and other localities of Brazil. Sweet and sour oranges, lemons, and *Citrus trifoliata* are amongst the species affected. On the affected organs the fungus forms a superficial, reticulate mycelial web, bearing both thyriothecia (shield-like perithecia) and pycnidia. The thyriothecia are sparse, rounded, lenticular-scutate, pale brown, 140 to 200 μ in diameter, with a pseudo-ostiole in the centre. The asci, immersed in a paraphysoid tissue, are clavate or cylindrical, prostrate, disposed radially with their apices converging towards the centre of the conceptacle, and measure 22 to 46 by 6·5 to 11 μ. The ascospores are hyaline, two-celled, somewhat constricted at the septum, straight, and 6 to 11 by 2 to 4 μ. The pycnidia are 80 to 150 μ in diameter, and contain hyaline, cylindrical, catenulate spores, 2·5 to 6·5 by 0·5 to 1·2 μ. The two stages are named *Stomiopeltis citri* n.sp. and *Sirothyrium citri* n.sp., respectively, with Latin diagnoses. A brief description, with Latin diagnosis, is also given of a variety, named *minor*, of the ascigerous stage which was observed on the green organs and fruits of oranges.

BITANCOURT (A. A.). **As manchas das Laranjas. Descrição das principais manchas, podridões e outras alterações das Laranjas, e dos meios para combatê-las.** [Orange spots. A description of the chief spots, rots, and other disorders of Oranges, and of measures for their control.]—*Inst. Biol. Defesa Agric. e Animal, São Paulo, Folh.* 53, 135 pp., 6 col. pl., 57 figs., 1934.

This very useful publication gives semi-popular descriptions of the chief spots, rots, and other defects of oranges caused in Brazil

by fungal and insect parasites, environmental factors, or physiological disorders. Most of the well-executed illustrations, including the coloured plates, are original. A special chapter deals at some length with remedial measures, including instructions for the preparation and application of fungicidal and insecticidal sprays, and a calculation of the cost of the various treatments under local working conditions.

FIFIELD (W. M.). **The effect of various wrappers on the preservation of Oranges in cold storage.**—*Proc. Florida State Hort. Soc., 1932*, pp. 57–60, [? 1933. Abs. in *Chem. Abstracts*, xxviii, 15, p. 4799, 1934.]

Plain, relatively heavy aluminium foil, embossed aluminium foil of the same weight, and plain, thin aluminium foil, as well as moisture-proof and S.S.T. cellophane [cf. *R.A.M.*, x, p. 253] proved far superior to plain, oiled, waxed, parchment, or copper sulphate-treated paper wrappers in reducing loss of weight in oranges during storage. The fruit wrapped in aluminium foil or cellophane kept in good condition for three to five months compared with only six weeks for that in paper coverings.

BLISS (D. E.). **Symptoms of decline disease.**—*Tenth Ann. Rept. Date Growers' Inst.*, p. 10, 1933. [Received September, 1934.]

One of the first symptoms of the 'decline' disease of Deglet Noor date palms in California [*R.A.M.*, xi, p. 572] is the premature death of leaves in the lower whorls. The rate at which new leaves appear is also greatly reduced, and during warm periods in August and September affected trees lose many more leaves than healthy ones, the leaves on the former rapidly turning brown and the petioles becoming tough and shrunken. Terminal growth becomes arrested or retarded, and the leaves (which point stiffly upwards, giving the top of the palm a flattened, brush-like appearance) are yellowish-green, the petiole being narrow and weak and the midrib and pinnae slender and shortened. Affected trees commonly have not more than ten bunches of dates, as against fifteen or twenty on healthy ones; the spathes are small and often appear late, and the fruit stalks are sometimes barely an inch wide and much weakened. The flowers remain normal, but the fruits, when those on healthy trees are ripe, are hard, fibrous, brittle, and shrivelled at the tip. The trunk, leaves, and fruit are stunted but free from lesions. Decay, usually associated with necrotic tissues, may extend from the roots into the base of the tree, but the disease does not appear to terminate fatally.

BLISS (D. E.). **Investigations on the cause of decline disease in Date Palms.**—*Eleventh Ann. Rept. Date Growers' Inst.*, pp. 4–6, 1934.

The 'decline' disease observed on Deglet Noor date palms in the Coachella Valley, California, about 1921 [see preceding abstract], though spreading to healthy trees of this variety in adjoining rows and other plantings, has not attacked the Zahidi, Kustawy, Halawy, Tazizaoot, or Iteema varieties. Badly affected trees show up to 90 per cent. of dead roots. In inoculation tests with numerous

fungi isolated from decayed roots only a species of *Omphalia* was strongly pathogenic to unwounded underground portions of seedling palms, palms in the two-leaf stage frequently being killed within fourteen days of inoculation, while older plants died after a longer interval or remained stunted. One culture of *Omphalia* produced lesions on 68 out of 79 potted Deglet Noor seedlings. The leaves wilted and died, necrotic lesions developed in the primary roots, and the young roots were often killed while emerging through the leaf sheaths at the base of the palm and before they reached the soil; fungal invasion of the base of the trunk followed and the young palms died as a result of attack on the meristematic tissue of the terminal bud. In larger palms the trunk was seldom affected to a depth of over one inch, and, as a rule, death did not result. When three-year-old palms growing in the field were exposed to infection by inoculating the soil at their bases with *Omphalia* they all became severely affected in four months, though similar palms in uninoculated soil remained healthy. The fungus was not found on healthy palms.

MAYNE (W. W.). **Some notes on Burgundy mixture and Burgundy injury.**—*Planters' Chron.*, xxix, 11, pp. 255–259, 1934.

In southern India several reports were received during the past year of injury sustained by coffee plants sprayed with Burgundy mixture. Although Bordeaux mixture is usually recommended as a spray for coffee, Burgundy mixture has found favour in some districts, presumably owing to the absence of grit and the smaller quantity of the alkaline ingredient required. The standard mixture consists of 5 lb. copper sulphate, $2\frac{3}{4}$ lb. soda ash (or $6\frac{1}{4}$ lb. washing soda), and 50 galls. water. Mixtures made with satisfactory materials in the correct proportions are approximately neutral; they become acid or alkaline according as an excess of copper or soda, respectively, is present.

The injuries caused by Bordeaux and Burgundy mixtures fall into three groups, namely, those due to acid (excess copper), alkaline (excess lime or soda), or normal mixtures. The first is the most serious of these forms of injury and is much more usual than the second. In an experiment in which Burgundy mixture made with materials combined in six different proportions was tested on coffee, no damage resulted at any strength from 5–$2\frac{1}{2}$–50 to 5–5–50. The problem of the injuries caused by normal neutral Burgundy mixtures is very complex, damage depending on the kind and vigour of the plant sprayed, the weather before and after the spraying, and the heaviness and strength of the mixture. The effects produced on plants very susceptible to spray injury show clearly that Burgundy is a more dangerous spray than Bordeaux mixture.

On the whole, coffee does not appear to be very liable to spray injury. No authentic instance of injury to this crop by properly prepared Bordeaux mixture has been seen at the Coffee Experiment Station, Mysore, nor has any report of such injury been received. Injury due to Burgundy mixture is unlikely to be common, but it may occur without any defect in the materials or the making. As a protective spray for coffee Bordeaux is preferable to Burgundy mixture, being safer and slightly more effective as a fungicide.

MASSEY (R. E.). **Section of Botany and Plant Pathology, G.A.R.S. Final Report on experimental work in 1932-33.**—*Ann. Rept. Gezira Agric. Res. Serv. for the year ended 31st December, 1933*, pp. 126–146, 1 plan, 4 graphs, [1934. Mimeographed.]

Exceptionally heavy rains in the Gezira, Sudan, in June, 1933, greatly favoured the persistence of ratoon growth from the stumps in the previous year's cotton land. In many cases the ratoons were already affected with leaf curl [see next abstract], and the presence of large numbers of whiteflies [*Bemisia gossypiperda*] led to rapid infection of the new crop. As chopping at ground level offered an inadequate means of clearing the old crop, a hand tool by which the whole plant and root could be pulled up was devised, the principle of which was adopted by the Sudan Plantations Syndicate, Ltd., who with a modified model of their own design disposed of the remains of the entire crop at the end of the season.

A quantitative examination made in conjunction with the Plant Observation Section of healthy and leaf curl plants of the same age, size, and development showed that the reduction in yield caused by the disease amounted to up to 50 per cent.

In two successive seasons some 40,000 well grown cotton plants were raised in an isolated area from seed taken from badly diseased leaf curled plants without any occurrence of leaf curl in the offspring.

Fusarium solani was isolated from the fine rootlets of wilting cotton [*R.A.M.*, xi, p. 513]. *Macrophomina phaseoli* [see above, p. 683] caused widespread seedling infection but little eventual loss of crop.

The amount of blackarm [*Bacterium malvacearum*: ibid., xii, p. 91] developing on the new season's cotton at the Gezira Research Farm between 30th October and 9th November, 1932, was ascertained to be directly influenced by the position of the plot in relation to the previous year's cotton, infection being worst on land adjoining that on which cotton was grown the previous year, in which infected debris might be expected to occur. Investigations into the persistence of *Bact. malvacearum* in plant remains and the possibility of destroying it therein by flooding [ibid., x, p. 662] showed that when heavily infected debris was spread on the soil and the plots resown after being completely flooded there was no recurrence of the disease.

When strips of cotton were sown in concentric arcs at increasing distances from badly infected cotton in an adjacent plot, the sector of the circle bordering the arcs being divided into two equal portions, in one of which the natural growth of weeds was left untouched, in the weeded sections the organism spread to a distance of 217 yards, whereas in the others it spread only 90 yards, the weeds evidently acting as barriers to spread.

No seed-borne infection occurred in the Gezira wherever disinfected (with abavit B) seed was sown. Where clean seed was sown the source of new infection by blackarm was normally the adjacent plot on which cotton had been grown during the previous season.

Consistent evidence was obtained that rough colony forms of *Bact. malvacearum* are non-pathogenic, whereas smooth forms are

pathogenic but become feeble with age. The bacteriophage was again recovered from infected soil [loc. cit.] but was not found in clean areas. Permanent clearing of broth cultures of the rough forms was repeatedly given by the bacteriophage extracted from soil, but the clearance of cultures of the smooth forms was invariably temporary.

An aqueous solution at 1 in 1,000,000 of four parts mercuric chloride and one part mercuric iodide inhibited the growth of *Bact. malvacearum* in five minutes and killed it in fifteen minutes; no other compound tested was so lethal.

COWLAND (J. W.). **Gezira Entomological Section, G.A.R.S. Final Report on experimental work, 1932–33.**—*Ann. Rept. Gezira Agric. Res. Serv. for the year ended 31st December, 1933*, pp. 107–125, 1 graph, [1934. Mimeographed.]

In an experiment conducted in the Gezira, Sudan, whiteflies (*Bemisia gossypiperda*) previously infected with the cotton leaf curl virus [*R.A.M.*, xi, pp. 452, 573, and preceding abstract] were fed for one to nine days on the immune lubia [*Dolichos lablab*] or on clean Sakel plants and then transferred to healthy Sakel seedlings. Successful transmission of the disease resulted for all the periods of clean feeding tested, provided that not fewer than 50 to 100 individuals were used. Experimental evidence was obtained that cotton plants are not viruliferous earlier than one day before the appearance of definite vein thickening. It was ascertained that cotton is susceptible to leaf curl at all stages of growth, but in older plants the development of the disease is considerably delayed or does not occur until secondary growth begins. A study of the differential resistance of cotton and related plants to infection derived from different sources was carried out by transmitting the leaf curl virus by large numbers of whiteflies from the susceptible Giza 7 cotton variety, Gezira Main Crop cotton, the resistant cotton variety XH 1029, *Hibiscus esculentus*, *H. cannabinus*, and weika (an annual variety of *H. esculentus*) to each of these plants. The results clearly indicated that XH 1029 maintained its resistance no matter what source of infection was employed, that when itself infected it is much less capable of passing on infection to other hosts than any of the other plants tried except *H. esculentus*, that *H. esculentus* only feebly transmits leaf curl, and that *H. cannabinus* is very susceptible and transmits the disease very readily.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August, 1933.—155 pp., 1 pl., 1934.

The following items of phytopathological interest occur in this report. The work of the Punjab cotton root rot scheme [*R.A.M.*, xii, p. 567] showed that the disease is mainly due to two species of *Rhizoctonia* which ceased to grow at 40° and 45° and died at 60° and 68° C., respectively; they are very tolerant of acidity and alkalinity and may remain dormant in the soil for a long time. In August, 1933, the Baroda root rot scheme was extended for a further period of three years. In this district three organisms appear to be involved in the causation of root rot, viz., a nematode, *Fusarium vasinfectum*, and *R. bataticola* [*Macrophomina phaseoli*:

see above, p. 696]. Plants affected by this form of root rot die from top to bottom, in contrast to those attacked by wilt (*F. vasinfectum*), which wither from the base upwards. None of the progeny of numerous plants from heavily infested fields gave evidence of resistance to root rot. In Broach and Jalgaon five-year breeding schemes have been in progress since 1931 with a view to the development of wilt-resistant cottons with good yielding, ginning, and spinning qualities. 'Red leaf' and leaf roll of American cottons appear to be associated with a definitely lower osmotic pressure in the diseased foliage.

WARE (J. O.) & YOUNG (V. H.). **Control of Cotton wilt and 'rust'.** —*Arkansas Agric. Exper. Stat. Bull.* 308, 23 pp., 1934.

The following cotton varieties have been found suitable for Arkansas conditions and extremely resistant to wilt (*Fusarium vasinfectum*) [*R.A.M.*, xi, p. 638]: two types of Dixie-Triumph (Watson and Marett), Dixie 14, Lightning Express, Super Seven (Coker), and Miller. Moderately resistant or wilt-tolerant are Arkansas Rowden 40, 2088 and 2119, Arkansas 17, D. & P.L. 4 and 6, Express 121, Cleveland 54, and Wilson Type Big Boll. Many of the promising newer strains, on the other hand, e.g., Delfos, Stoneville, Acala, and Qualla, proved highly susceptible to the disease under experimental conditions and are therefore undesirable for use where the disease is severe. Further work on the combined control of wilt and 'rust' or potash hunger indicated that the best result may be expected from the application of a mixed fertilizer containing relatively large amounts of potash.

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **Comparing soil fungicides with special reference to Phymatotrichum root rot.**— *Science*, N.S., lxxix, 2061, pp. 595–596, 1934.

Of a number of volatile chemicals recently tested in the laboratory for their toxicity to the root rot fungus (*Phymatotrichum omnivorum*) in Texas, pentachlorethane, tetrachlorethane, and xylene proved the most effective. In a preliminary field test, tetrachlorethane placed in the soil at a depth of 6 in. destroyed the fungus on cotton roots to depths of at least 2 ft.

HILL (S. B.), YOTHERS (W. W.), & MILLER (R. L.). **Effect of arsenical and copper insecticides on the natural control of whiteflies and scale insects by fungi on Orange trees in Florida.**—*Florida Ent.*, xviii, 1, pp. 1-4, 1934. [Abs. in *Rev. Appl. Entomol.*, A, xxii, 8, p. 455, 1934.]

Tests were made of the effect of lead arsenate and copper compounds as used against *Ceratitis capitata*, on the control effected by the entomogenous fungi attacking Aleyrodidae [including *Aschersonia aleyrodis*, *A. flavocitrina*, and *Aegerita webberi* on *Dialeyrodes citri*] and purple scale (*Lepidosaphes beckii*) [by *Sphaerostilbe coccophila*] on orange trees in Florida [*R.A.M.*, iii, p. 579; vi, p. 419; xii, p. 568].

It was found that lead arsenate, cryolite, and potassium aluminium fluoride at the concentrations used permitted an increase of Aleyrodidae amounting after eight months to between 1½ and

5 times that of the infestation on untreated trees, the corresponding figures for the copper compounds being 5 to 10 times. The natural fungus control of Aleyrodidae in unsprayed groves may be as high as 90 per cent. whereas only 40 to 50 per cent. can be expected where copper-containing sprays, e.g., Bordeaux mixture, are applied. The population of *L. beckii* on trees sprayed with copper compounds was nearly twice as great as that on untreated, Bordeaux mixture (4-4-50) allowing the heaviest increase, closely followed by copper carbonate. The natural control of 60 per cent. to be anticipated in unsprayed groves is reduced to 20 per cent. in those treated with Bordeaux mixture.

LAKON (G.). **Entomophthoraceen-Studien I–IV.** [Studies on Entomophthoraceae I–IV.]—*Zeitschr. Angew. Entom.*, xxi, 1, pp. 89–95, 1934.

From a detailed consideration of the taxonomic position of the fungus described by Speare (*Rept. Exper. Stat. Hawaiian Sugar Planters' Assoc., Bull.* 12, p. 14, 1912) as *Entomophthora pseudococci* n. sp. on *Pseudococcus calceolariae*, the writer concludes that this organism is identical with *Lamia apiculata* (Thaxt.) Lakon (*Zeitschr. Angew. Entom.*, v, p. 161, 1919), originally described by Thaxter in 1888 as *Empusa apiculata*, the insignificant differences observed by the first-named worker being insufficient for the establishment of a new species.

Discussing the classification of the insectivorous Entomophthoraceae, the writer favours the retention of the three genera, *Empusa*, *Lamia*, and *Entomophthora*, the last-named being characterized, in contrast to the others, by more or less profusely branched conidiophores. Specially characteristic of *Lamia* are the predominantly simple conidiophores and the presence of rhizoids.

German diagnoses are given of *Entomophthora blunckii* n. sp. on *Plutella maculipennis* and *Tarichium* (a provisional form genus) *hylemyiae* n. sp. on *Hylemyia coarctata*. The former is characterized by pale greenish-yellow, elliptical conidia, 15 to 22 by 8 to 11 μ (average 19 by 9 μ), borne on branched, grey to greenish-yellow conidiophores, 8 to 10 μ in width, accompanied by a few rhizoids. The latter may be recognized by resting spores (azygospores), 60 μ in diameter, arising on short hyphal elements within the body of the host and furnished with a thick, echinulate, pale orange-yellow membrane.

MCMARTIN (A.). **The locust fungus. Further observations.**—*South African Sugar Journ.*, xviii, 6, pp. 329, 331, 1934.

The natural occurrence of *Empusa* [*grylli*: *R.A.M.*, v, p. 93; xiii, p. 656] on the redwing locust [*Locusta migratoria migratorioides*] is stated to be widespread and of increasing intensity throughout the cane belt of Natal. In the normal course the external growth of the fungus appears shortly after death between the abdominal segments; in one case examined locusts dying about 5 p.m. showed an extensive external development by 11 p.m. Fungal growth continues as long as damp conditions are maintained, until finally the insect disintegrates. The pale yellow conidia of the fungus are produced in such numbers as to give a glistening,

powdery aspect to the surface of the growth, whence they are shot off and adhere to any object on which they fall.

In order to obtain a profusion of conidia a dry atmosphere is required; dried locusts killed by the fungus are covered with the yellow powder in such quantity that it may be scraped off with a knife, while the leaves to which the insects cling also bear masses of the conidial dust. Conidial germination is dependent on moisture, but it is not known how the living insects become infected. So far, the results of inoculation experiments under controlled conditions are inconclusive, and research is considerably hampered by the lack of artificial cultivation of the fungus. The redwing locust appeared in Natal in 1894, to be followed a year later by *E. grylli*; in 1899 and 1900 both the insect and its natural enemy were present. There is no doubt that the fungus does act as a check on the locusts, but the full extent of its utility in this field cannot yet be determined.

DANIEL (G. E.). **Studies on Ichthyophonus hoferi, a parasitic fungus of the herring, Clupea harengus. I. The parasite as it is found in the herring.**—*Amer. Journ. of Hygiene*, xvii, 1, pp. 262–276, 15 figs., 1933.

Reference to this paper has already been made in the account by F. F. Fish of the herring (*Clupea harengus*) disease due to *Ichthyophonus* [*Ichthyosporidium*] *hoferi* [*R.A.M.*, xiii, p. 576]. The following is the life-cycle tentatively suggested by the author for the parasite. From the large, polynucleate cysts (up to 50 μ in diameter) in the infected fish, one or more hyphae, up to several hundred microns long, are produced, the cytoplasm leaving the cyst capsule and concentrating in the hyphae. Discrete, spherical, uni- to polynucleate spores of variable size are formed on the division of the hyphal cytoplasm and liberated by the rupture of the hypha at its distal end. Alternatively to this series of phases, the cytoplasm of the mother cyst may begin to fragment and the wall is ruptured to liberate a plasmodium-like body in the host tissue. By further fragmentation, bodies consisting of a nucleus surrounded by a small quantity of cytoplasm are formed and ultimately develop into polynucleate cysts capable of repeating either of the processes outlined.

SCHMIDT (P. W.). **Dermatomykosen.** [Dermatomycoses.]—*Dermatol. Zeitschr.*, lxix, 3, pp. 161–173, 1934.

The writer lists and briefly discusses the principal contributions to the study of the dermatomycoses that appeared during 1933, under the general headings of botanical, cultural, and microscopic examination, experimental biology, general, floristic (frequency statistics), and clinical observations.

CIFERRI (R.) & REDAELLI (P.). **Sporendonema epizoum (Corda) Cif. et Red.; an entity including Hemispora stellata and Oospora d'agatae.**—*Journ. Trop. Med. & Hygiene*, xxxvii, 11, pp. 167–70, 1934.

A complete Latin diagnosis is given of *Sporendonema epizoum* (Corda) Cif. et Red. n. comb. (*Torula epizoa* Cda), the synonyms of

which include *Hemispora stellata* [*R.A.M.*, xii, p. 444], *Oospora d'agatae* [ibid., xii, p. 218], *Torula fuliginea*, *T. pulchra* [both regarded, with some other fungi, as identical with *T. sacchari* by Van Luijk: ibid., viii, p. 66], and a number of other names. A brief account is given of the morphological and cultural characters of the fungus, supplemented by a taxonomic discussion of its identity and notes on its somewhat doubtful pathogenicity to man and animals, a full description being reserved for publication in an Italian journal.

MONTPELLIER (J.) & CATANEI (A.). **Résultats de l'étude d'un nouveau mycétome du pied observé à Alger.** [Results of the study of a new mycetoma of the foot observed at Algiers.]—*Bull. Soc. Path. Exot.*, xxvii, 3, pp. 209–214, 1 fig., 1934.

A fungus characterized by white, downy colonies, elongated or ovoid, sessile or subsessile conidia measuring 5·5 by 3 μ, and lateral or terminal ovoid chlamydospores, 2·5 μ in diameter, was isolated from a mycetoma on the foot of an Algerian native in 1933. The barley grain medium of Langeron and Milochevitch [*R.A.M.*, ix, p. 781] proved eminently suitable for the culture of the organism, which was identified as *Acremonium potroni* Vuillemin.

SCHMIDT (P. W.). **Über die Scherflechte bei Rindern. (Die in Westfalen ursächlichen Trichophytonarten und durch sie hervorgerufenen atypischen Hauterscheinungen).** [On ringworm in cattle. (The species of *Trichophyton* involved in Westphalia and the atypical skin manifestations caused by them).]—*Dermatol. Wochenschr.*, xcviii, 1, pp. 9–13, 3 figs., 1934.

Trichophyton rosaceum was found to predominate as the cause of ringworm among the cattle belonging to patients treated for the disorder at the Münster (Westphalia) University Skin Clinic [*R.A.M.*, xiii, p. 237], *T. faviforme* [ibid., xiii, p. 511] and *T. gypseum asteroides* [*T. mentagrophytes*] being only occasionally found on the animals. Attention is drawn to the completely atypical forms frequently assumed by ringworm in cattle, and to the resulting risk of infection by their unsuspecting owners.

SCHWARTZ (W.) & KAESS (G.). **Das Wachstum von Schimmelpilzen auf gekühltem Fleisch bei verschiedenen Luftzuständen.** [The growth of moulds on chilled meat in various atmospheric conditions.]—*Arch. für Mikrobiol.*, v, 2, pp. 157–184, 1 fig., 1 diag., 8 graphs, 1934.

At the Karlsruhe Technical Institute pieces of meat were inoculated with *Penicillium flavo-glaucum*, *Mucor racemosus*, and *Cladosporium herbarum*, all prevalent in the atmosphere of slaughter-houses and cold storage rooms [*R.A.M.*, xiii, p. 442], and exposed to temperatures of 0°, 3°, and 6° C. at a humidity range of 75 to 100 per cent. *M. racemosus* was found to make the most rapid growth and *C. herbarum* the slowest, conidial development in the former reaching a maximum at 6°, with high atmospheric humidity. *M. racemosus* was found to overgrow an area of 3 sq. cm. in 11 days at 0°, whereas *P. flavo-glaucum* and

C. herbarum required 30 and 32 days, respectively, to cover the same space.

It is apparent from these data that *M. racemosus* was, in this case, the decisive factor in curtailing the period during which the meat could safely be held in cold storage, and that the results of experiments in its control may be generally applied to other meat moulds without appreciable modifications. The reduction of atmospheric humidity below the optimum for mould growth of 95 per cent. is not considered to be a practicable control measure under present-day storage conditions owing to its adverse effect on the constitution of the meat.

KAESS (G.) & SCHWARTZ (W.). **Untersuchungen über den Einfluss der Luftbewegung auf das Wachstum von Schimmelpilzen auf gekühltem Fleisch.** [Investigations on the influence of the circulation of air on the growth of moulds on chilled meat.]—*Arch. für Mikrobiol.*, v, 3, pp. 443–450, 1 diag., 3 graphs, 1934.

The exposure of meat inoculated with *Penicillium flavo-glaucum* and *Mucor racemosus* [see preceding abstract] to an air current of 5 and 12 cm./sec. at temperatures of 6° and 3° C. and an atmospheric humidity of 90 per cent. delayed the growth of the moulds to a certain extent, but not enough appreciably to lengthen the storage period. The favourable effect of the air current is attributable rather to the production of a correct balance between temperature and humidity relations than to a direct action on the moulds.

BURGESS (R.). **Causes and prevention of mildew on wool.**—*Journ. Soc. Dyers & Colourists*, l, 5, pp. 138–142, 1934.

Among the factors briefly discussed as contributing to the development of mildew on wool [cf. *R.A.M.*, xii, p. 24] may be mentioned treatment of the material with peroxide and intensive chlorination. Bacterial action, as opposed to that of moulds, has recently been shown to occur only at very high humidities. In a controlled atmosphere of under 100 per cent. relative humidity, the common moulds do not act as precursors of bacterial invasion. The distribution of fungi throughout a mildewed cheese of yarn in storage denotes over-conditioning, whereas the presence of numerous bacteria denotes a prolonged state of actual wetness.

Of the antiseptics applied for the prevention of mould growth during the winding process, preventol liquid and 2 per cent. shirlan NA [ibid., x, p. 598] have given the most promising results with superior Botany wool. Applied in backwashing, 0·7 per cent. shirlan NA gave four weeks' protection on Botany yarns, while similar results were obtained on crossbred wools with 0·6 per cent. shirlan NA, 0·67 per cent. sodium-*o*-phenylphenate, and 1 per cent. sodium silicofluoride with the addition of 0·1 per cent. igepon A paste. The addition of shirlan NA to a half-and-half mixture of olive oil and water, adjusted so as to give 3 per cent. oil and 0·2 per cent. antiseptic on the wool, conferred marked protection over

22 days, while a still better effect was obtained by the use of 5 per cent. Special Spinning Oil with the addition of 0·15 per cent. shirlan paste [ibid., xi, p. 679]. Other beneficial treatments deserving of further consideration include the use, e.g., in the form of crystals, of volatile antiseptics, bleaching with sulphur dioxide, chroming, and treatment with eulan NK [ibid., x, p. 598]. The substitution of bakelite cones for the cheap paper ones commonly used in winding gives good control of the mildew contracted through this source, but here expense is a limiting factor.

The paper (read at a meeting of the West Riding Section of the Society at Bradford on 7th December, 1933) was followed by a discussion.

WESTCOTT (CYNTHIA). **Brand canker of Rose, caused by Coniothyrium wernsdorffiae Laubert.**—*Cornell Agric. Exper. Stat. Memoir* 153, 39 pp., 5 pl., 2 figs., 6 graphs, 1934.

After a brief historical account of brand canker (*Coniothyrium wernsdorffiae*) of the rose [*R.A.M.*, xii, p. 633] in various parts of the world, the author gives a summarized report of four years' investigation of the disease in America, most of the research work having been done at Ithaca, New York. A comparative description is given of the symptoms of brand and stem canker (*C. fuckelii*) [*Leptosphaeria coniothyrium*: loc. cit.], and the characters distinguishing the two are indicated. Further, *C. wernsdorffiae* was shown to have larger pycnidia and larger spores (4·2 to 8·4 by 3·6 to 7·2 μ, as compared with 2·4 to 4·8 by 2·4 to 3·6 μ) than those of *L. coniothyrium*, the significance of the difference in spore measurements being statistically established [cf. ibid., ix, p. 722]. *C. wernsdorffiae* has also lower optimum and maximum temperatures for growth and develops more slowly than *L. coniothyrium*. Examination of the type specimen of *C. rosarum* [loc. cit.] at the Kew Herbarium indicated that it may not be identical with *C. fuckelii*, but the canker-forming fungus identified by Vogel as *C. rosarum* may be *C. fuckelii*, as suggested by Waterman [loc. cit.].

As regards the pathogenicity of *C. wernsdorffiae*, the fungus was capable of attacking any variety of rose treated as a climber in the garden at Ithaca, and no outstanding differences in susceptibility were noticed. While some tea varieties proved to be susceptible on inoculation, this group remained free from natural infection. Infection usually occurs in late winter or early spring through a break or wound in the epidermis during the period when the rose stocks are protected against winter conditions with earth or other covering around the base; infections were few or absent in plants left uncovered throughout the winter, indicating an easy method for the almost complete control of the disease, which was shown not to be amenable to control by spraying or dusting with fungicides during the growing season, or the application of lime-sulphur as a dormant spray late in the autumn. Observations during two years showed no correlation between non-protection of the rose plants and poor overwintering in the majority of the 76 varieties thus tested.

JERMIESS. **Bekämpfung von Asternkrankheiten.** [The control of Aster diseases.]—*Ratschläge für Haus, Garten, Feld*, ix, 6, pp. 107–108, 1934.

In a well-known horticultural district near Hamburg the profitable aster [*Callistephus chinensis*] trade is stated to be threatened by the *Fusarium* disease [in which several species appear to be involved: *R.A.M.*, xi, p. 718; xii, pp. 448, 633]; the losses from this source in many nursery-gardens amount to 70 per cent. Good control has been obtained by fertilizing with lime, phosphorus, and potash in preference to nitrogen, immersion of the seed in 0·25 per cent. uspulun, seed-bed disinfection three weeks before sowing with uspulun (75 gm. in a sufficient quantity of water for the thorough moistening of 1 sq. m.), washing the frame windows with 0·25 per cent. uspulun, dipping the roots of the seedlings before transplanting in a loam-uspulun emulsion, and (in cases of heavy soil infestation) pouring a 0·25 solution of uspulun into the plant holes.

EMSWELLER (S. L.) & JONES (H. A.). **The inheritance of resistance to rust in the Snapdragon.**—*Hilgardia*, viii, 7, pp. 197–211, 5 figs., 1934.

Snapdragon (*Antirrhinum majus*) rust (*Puccinia antirrhini*) [*R.A.M.*, iii, p. 721; xiii, p. 445], first observed in California in 1896, appeared near Chicago in 1913 and subsequently spread practically all over the United States. In 1930, very high resistance was shown by several plants grown in badly infected areas in California from resistant seed selections made in Indiana. Progenies from these, open pollinated, were grown in various parts of California and gave several resistant plants. Some of the latter were self-pollinated in 1931 and a few were crossed with known susceptible varieties. When the seed from these was grown on in 1932 evidence was obtained that resistant plants were of two types, one homozygous for resistance and the other heterozygous. Resistance was governed by a single dominant gene, but modifying genes are also present.

Transfer of the resistant gene to commercial varieties by the back-cross method has already given very encouraging results.

PAPE (H.). **Die Botrytiskrankheit der Lilien.** [The *Botrytis* disease of Lilies.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 28, p. 363; 29, p. 387, 2 figs., 1934.

A popular account is given of the symptoms, mode of infection, and control of the *Botrytis* disease of lilies, associated with *B. elliptica*, *B. hyacinthi*, and *B. cinerea* [*R.A.M.*, xi, p. 108; xiii, p. 165], in Schleswig-Holstein, where a stand of *Lilium candidum* was destructively attacked in 1933. Reports from the United States indicate that *L. longiflorum*, *L. candidum*, *L. chalcedonicum*, and *L. testaceum* are among the most susceptible varieties, *L. callosum*, *L. concolor*, *L. hansonii*, *L. japonicum*, *L. martagon*, *L. pyrenaicum*, and *L. willmottiae* being comparatively resistant. All the aerial portions of the plant are affected by the disease, which is

characterized by a grey to brown or orange spotting of the foliage followed by a soft rot of the leaves and stems.

IKATA (S.) & HITOMI (T.). **Studies on the putrefaction disease of edible Lilies.**—*Rept. Agric. Exper. Stat. Okayamaken Extra No.* 39, 16 pp., 5 pl., 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vii, 1–2, p. (6), 1934.]

Botrytis elliptica [see preceding abstract] is stated to cause a leaf spot of lilies grown for food in Okayamaka, Japan, eventually leading to the death of the entire plant, the edible bulbs of which are much esteemed. Infection appears to take place directly through the leaf cuticle without the aid of wounding. The fungus spreads more rapidly on the lower than on the upper surface, owing partly to the lesser thickness of the former and also to the presence on it of stomata, which are absent from the latter.

NICOLAS (G.) & AGGÉRY (Mlle B.). **Sur les relations qui existent entre Daphniphyllum glaucescens, Phyllosticta daphniphylli et des bactéries et sur un type assez fréquente de maladie bactérienne.** [On the relations existing between *Daphniphyllum glaucescens*, *Phyllosticta daphniphylli*, and bacteria, and on a fairly common type of bacterial disease.]—*Bull. Soc. Hist. Nat. Toulouse*, lxv, 2, pp. 354-362, 3 figs., 1933. [Received May, 1934.]

This is an expanded account of the authors' observations on the association of bacteria with the fungus *Phyllosticta daphniphylli* in the yellow to reddish-brown lesions not only on the stems but also on the leaves of *Daphniphyllum glaucescens* [*R.A.M.*, x, p. 387]. The same organisms were further jointly responsible for the occlusion of the wood vessels and consequent desiccation of the branches. Two types of bacteria were isolated from the infected tissues, one spherical, occurring singly or in groups of two (rarely four), measuring 0·8 μ in diameter, and the other arranged in small chains (1·8 to 2·7 μ), staining with gentian violet and Gram-negative.

BOCZKOWSKA (MARIE). **Les maladies et insectes nuisibles aux Graminées des tourbières à Poléssié (Pologne).** [Diseases and insects attacking Gramineae in the peat-bogs of Poléssié (Poland).]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 39–43, 1934.

After a few brief notes on the work that is being done in Poland since 1924 with the object of reclaiming the extensive peat-bogs existing in that country for agricultural purposes, and more particularly for the establishment of pastures and hay meadows, the author gives a briefly annotated list of the diseases (nine due to fungi, three non-parasitic) and insect pests of forage grasses which have been observed at the Agricultural Research Station of Sarny. The best results in the treatment of the 'reclamation disease' [*R.A.M.*, xii, p. 656; xiii, p, 57], which is very prevalent during the first few years of cultivation of reclaimed peat-bogs, were obtained with applications to the soil of copper sulphate at the rate of 20 kg. per hect., a dose considerably lower than that found

to be effective in other countries [loc. cit.]. Thus in 1931 *Phleum pratense* developed well on plots treated with copper sulphate, while on control plots the leaves of the grass dried up prematurely, before the ears could emerge from the sheaths. *Epichloe typhina* [ibid., xiii, p. 169] was observed in 1928 and 1929 on a few plants of the *Agropyron repens* plots, while in 1930 practically all the plants on these plots were attacked by this fungus. Other records include *Erysiphe graminis*, *Puccinia graminis*, and *Claviceps purpurea*.

DIEHL (W. W.). **The Myriogenospora disease of grasses.**—*Phytopath.*, xxiv, 6, pp. 677–681, 2 figs., 1934.

Details are given of the recovery of *Andropogon scoparius* clumps from Louisiana from the stunting and fasciation caused by *Myriogenospora* (?) *paspali* [*R.A.M.*, xii, p. 203], the disappearance of which coincided with the resumption of normal growth by the plants. Under the influence of the parasite the clumps presented symptoms very similar to those of pokkah-boeng of sugar-cane [*Gibberella moniliformis*: ibid., xiii, p. 59 and above, p. 686]. The fasciation which is such a striking feature of diseased plants seems to be chiefly due to a mechanical binding by the fungous tissue of adjacent leaves and culms during the growth of the shoot. Inoculation experiments with the *Myriogenospora* from *A. scoparius* on the same host, *Paspalum dilatatum*, and sugar-cane gave negative results. *M. aciculisporae*, reported on sugar-cane from Brazil [ibid., ix, p. 808], does not appear to cause the fasciation characteristic of infection by *M. paspali*, and no record exists of a *Myriogenospora* on sugar-cane in the southern United States, but otherwise there are no essential differences between these species, with which *M. bresadoleana* is also closely allied. For the present, therefore, the exact identity of the species on *Andropogon* must be left open.

CRISTINZIO (M.). **Malattie delle piante da frutto nella Campania e nel Mezzogiorno.** [Diseases of fruit trees in Campania and southern Italy.]—*Ricerche, osservazioni ed divulgazioni fitopatologiche per la Campania ed il Mezzogiorno* (*Portici*)—issued by R. Lab. Pat. Veg., Portici, iii, pp. 47–87, 2 pl. (1 col.), 15 figs., 1934.

An account is given of the losses caused by, and the symptoms and control of, the following diseases of fruit trees in southern Italy: leaf curl of peaches and almonds (*Exoascus* [*Taphrina*] *deformans*) and of plums (*E.* [*T.*] *pruni*), witches' broom of cherries (*E.* [*T.*] *cerasi*), peach mildew (*Sphaerotheca pannosa*), plum, cherry, and apricot mildew (*Podosphaera* [*oxyacanthae* var.] *tridactyla*, [*R.A.M.*, v, p. 699], shot hole of peach and apricot (*Clasterosporium carpophilum*) [ibid., xii, p. 301], blossom wilt of various fruit trees (*Sclerotinia cinerea*), plum rust (*Puccinia pruni-spinosae*) [ibid., xiii, p. 313], scab (*Fusicladium cerasi*) of cherries and other stone fruits [ibid., vii, p. 557], root rot due to *Rosellinia necatrix*, *Armillaria mellea*, and other organisms [ibid., xi, pp. 110, 791], and crown gall (*Bacterium tumefaciens*) [ibid., xii, p. 516].

ATANASOFF (D.). **Bitter pit of pome fruits is a virus disease. 1st Contribution.**—*Yearbook Univ. of Sofia, Fac. of Agric.*, xiii, pp. 1–8, 5 figs., 1934.

After a brief reference to his previous communication on bitter pit of apples [*R.A.M.*, xiii, p. 169], the author states that an extensive survey of orchards and nurseries during the summer of 1933 showed that the disease is widespread on apples, pears, and quinces in Bulgaria. It was further shown that all trees affected with bitter pit exhibit a characteristic mottling of the leaves [a description of which is appended], in the form of light green spots, blotches, or haloes, varying in intensity with the variety affected, and usually becoming obscure or disappearing completely during the latter part of the summer. This mottling closely resembles that of plum pox [ibid., xiii, p. 170], to a degree which would suggest the identity or close relationship of the two causal agencies. The condition was finally shown to be transmissible by grafting to healthy apple trees in a small series of experiments. It differs from the apple leaf mottling described by Bradford and Joley from Michigan [ibid., xii, p. 636], but is apparently identical with that observed by Valleau on the plum and the peach in Kentucky [ibid., xii, p. 454].

All these facts are considered to support fully the author's theory that bitter pit is a virus disease of pome trees. In his view it represents a problem as complicated as was that of the degeneration diseases of potatoes some thirty years ago, the proper solution of which will require much effort and may necessitate the production of new varieties free from infection.

CURTIS (K[ATHLEEN] M.). **Fireblight. A survey of current knowledge and recent advances.**—*Cawthron Inst. (New Zealand) Mycol. Publ.* 10, 8 pp., 6 figs., 1934.

In this paper, based on recent researches into the subject made in various countries, the author briefly traces the history of the outbreaks of fireblight of pome fruits (*Bacillus amylovorus*) that have occurred in New Zealand [*R.A.M.*, xi, p. 184]. Spread to the Nelson district of the South Island [ibid., viii, p. 795; x, p. 318] occurred during or shortly before 1932–3. An account of the disease is given in popular terms, the points dealt with including the causal organism, symptoms, transit of the bacillus in the plant tissues [ibid., viii, p. 177], overwintering, spread by insects [ibid., xii, p. 701] and rain, varietal susceptibility [ibid., xi, p. 497; xii, p. 11], host range in New Zealand and America, soil infection [ibid., xi, p. 723], and prevention and control [ibid., xii, p. 766; xiii, p. 102]. A bibliography of 18 titles is appended.

THOMAS (H. E.) & ARK (P. A.). **Nectar and rain in relation to fire blight.**—*Phytopath.*, xxiv, 6, pp. 682–685, 1934.

The nectar of pear, apple, quince, and cherry blossoms on trees grown in a dry atmosphere in California was found to contain sugars in concentrations considerably in excess of those permitting growth of the fireblight organism (*Bacillus amylovorus*) [*R.A.M.*, xii, p. 766] in culture solutions. During wet weather the volume of nectar in the blossoms is increased and its sugar concentration

reduced, and it is suggested that the higher incidence of blossom infection in wet weather may be correlated with more profuse development of the pathogen in the nectar rather than with its direct dissemination in the rain drops.

WINKELMANN (A.). **Die Fusikladium- oder Schorfkrankheit.** [The *Fusicladium* or scab disease.]—*Biol. Reichsanst. für Land- und Forstw., Flugbl.* 1, Zwölfte Auflage [Twelfth edn.], 4 pp., 4 figs., 1934.

Popular notes are given on the symptoms, life-cycle, and control of apple, pear, and cherry scab (*Venturia inaequalis*, *V. pirina*, and *V. cerasi*), and on the varietal reaction of apples and pears to the disease under German conditions.

MOORE (M. H.). **A field spraying trial of combined fungicide-contact insecticide sprays in 1933. A progress report.**—*Ann. Rept. East Malling Res. Stat. 1st Jan. 1933 to 31st Dec. 1933*, pp. 156–165, 1934.

In 1933, excellent control of scab (*Venturia inaequalis*), red spider (*Oligonychus ulmi* Koch) [*Paratetranychus pilosus* C. & F.], and sawfly (*Hoplocampa testudinea*) was obtained on Cox's Orange Pippin apple trees at East Malling [cf. *R.A.M.*, xii, p. 766] by spraying with lime-sulphur-nicotine-sulphite-lye; when derris was used instead of nicotine equally good scab control resulted, but the combination was less effective against sawfly. Owing largely to the warm, dry spring, one pre-blossom application of lime-sulphur was as effective against scab as were two, though the unsprayed controls became severely infected.

MOORE (M. H.). **Some field observations on Apple canker (Nectria galligena).**—*Ann. Rept. East Malling Res. Stat. 1st Jan. 1933 to 31st Dec. 1933*, pp. 166–175, 4 figs., 1934.

Observations [which are tabulated and discussed] on a large number of Cox's Orange Pippin and Stirling Castle apple trees at East Malling systematically sprayed for several years in succession against scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*] showed no consistent evidence that any particular spray applied to trees on the same rootstock gave any cumulative control of canker (*Nectria galligena*), the condition of the tree (dependent largely on soil conditions and type of rootstock) being a much more potent factor than spray treatment in determining the amount of canker infection that developed. If rootstock effect is disregarded, there was a slight suggestion that spraying, especially with Bordeaux mixture, reduced infection on the Cox's Orange Pippin trees [*R.A.M.*, ix, p. 113], which, under the conditions prevailing at East Malling, were more susceptible than the Stirling Castle trees.

Both varieties were more susceptible when worked on rootstocks East Malling XVI and XIII [ibid., xii, pp. 33, 298] than on any other.

When removing cankers all infected tissue must be cut out, but merely discoloured wood may safely be left.

BURRELL (A. B.). **The effect of irrigation on the occurrence of a form of the cork disease and on the size of Apple fruits.**—*Proc. Amer. Soc. Hort. Sci.*, xxx, pp. 415–420, 1 fig., 1 graph, 1933. [Received August, 1934.]

The author states that a special form of apple cork spot [a brief description of which is given: cf. *R.A.M.*, xii, p. 769] was prevalent in 1933 in several of the United States and in the Ontario and Quebec provinces of Canada, in regions where the summer had been drier than usual, the losses in different orchards varying from nil to 75 per cent. of the crop. The principal injury was reported as occurring on the lighter soils, and to be most prevalent on trees of high vigour, e.g., those that had received liberal applications of nitrogenous manure. The disease affected chiefly, if not entirely, fruit that attained normal size. The evidence obtained from experiments in two separate orchards [details of which are given] clearly indicated that irrigation decreased the amount of this form of cork and increased the size of the fruit, to an extent which was considered by the growers concerned as satisfactory from the standpoint of commercial control. Failure to get even better control may have been due to improper timing and distribution of water, or to some other etiological factor or factors.

TINDALE (G. B.). **Pears in cold storage.**—*Fruit World of Australasia*, xxxv, 6, p. 293, 1934.

When pears are kept in cold storage at a constant temperature the rate of production of carbon dioxide gradually increases to a peak and then rapidly falls to zero when scald [*R.A.M.*, ix, pp. 534, 660, 726; xi, p. 54] develops. The time required to reach this peak at any given temperature is the maximum storage life at that temperature, after which ripening is impossible, as the fruit develops mealiness, core-collapse [ibid., ix, p. 254], and other disorders. At 32° and 36° F. the Williams pear has a storage life of 12 and 7 weeks, respectively, though Winter Cole and Winter Nelis can safely be kept in cold storage for six months. Pears destined for cold storage must be picked in the hard, green state, as soon as they are large enough to pack. In general, the earlier pears mature the shorter their storage life. Each variety appears to have its own storage life irrespective of where grown.

TILLER (L. W.). **Use of copper sulphate-treated paper in the cold storage of Pears.**—*New Zealand Journ. of Sci. & Techn.*, xv, 6, pp. 403–407, 2 figs., 1934.

In a preliminary test at Nelson, New Zealand, in 1932, 75 per cent. of the sound Winter Cole pears wrapped in copper sulphate-treated paper and placed between two layers of fruit infected with *Botrytis* [*cinerea*] remained free from contamination in cold storage [*R.A.M.*, xiii, p. 246] while all the fruit in a control case containing pears wrapped in plain paper became affected. In 1933 a further experiment was conducted, using heavier paper which was found on analysis to contain 5·1 per cent. anhydrous copper sulphate. In this instance the top and bottom layers of fruit were arranged so as to be infected to varying extents by *Botrytis*

(slightly, 25 to 50, and 75 to 100 per cent.). The pears were picked on 6th March, stored unwrapped at 30° to 32° F. until 3rd July when the test was started. On examination on 2nd November it was found that only three out of 64 pears in the central layers of all three cases were infected, as against practically every one in the control boxes packed with fruit in ordinary paper. The immediate general use of fungicidally treated paper is limited in the first place by certain difficulties of manufacture which should, however, be possible to overcome, and in the second by the high cost of the material, 12 cents per lb. f.o.b. having been quoted for a New York product.

WORMALD (H.). **Bacterial diseases of stone-fruit trees in Britain. V. Some field observations and experiments on Plum bacterial canker.**—*Ann. Rept. East Malling Res. Stat. 1st Jan. 1933 to 31st Dec. 1933*, pp. 147–153, 1934.

Investigations [which are described and the results of which are tabulated] into the control of bacterial canker of plum trees in England (*Pseudomonas mors-prunorum*) [*R.A.M.*, xii, p. 227] showed that pruning or cutting back in autumn should be avoided, as on branches and stems the organism is mostly, if not exclusively, a wound parasite and infection occurs most readily in autumn and winter, probably as a sequel to leaf infection. Inoculation experiments and field observations demonstrated that Victoria plums are very susceptible to bacterial canker when worked on Brussels, Brompton, Common Plum, or Myrobolan B stocks. The Deniston Gage variety, although apparently resistant to natural infection, was as susceptible as the Victoria variety in artificial inoculations. Cankers artificially induced on Brussels stems were smaller than those similarly produced on Victoria stems. Victoria trees worked on Common Plum or Myrobolan B were less liable to be killed by the disease when worked high (so that most of the stem consisted of the rootstock variety) than when worked low (stem Victoria from ground level upwards). In a preliminary manurial trial potash applied to budded trees during the year the buds grew out had no restraining influence on their predisposition to the disease.

BROWN (H. P.). **Internal breakdown of Apricots.**—*Agric. Gaz. New South Wales*, xlv, 6, pp. 337–340, 4 figs., 1934.

Apricot fruits in the Murrumbidgee area of New South Wales are affected every year by an internal breakdown, which in 1933–4 caused very severe losses. The condition develops while the fruit is ripening, and when slight chiefly affects the larger, more heavily coloured, more mature fruits, which when cut open show a brownish discoloration near the pit; this spreads into the flesh which develops a soft, mushy rot. In severe attacks all the mature or nearly mature fruits may show the internal discoloration or rotting. Affected fruits, if they remain on the tree, exude a black, viscous fluid which produces scald-like injuries on the leaves; later they become dark brown or black, mummified, and with a pliable, leathery texture. Even slightly affected fruits dried by the usual processes are worthless.

Field and laboratory observations indicated that the breakdown is due primarily to excessive soil moisture just before picking, as the result of defective irrigation practices, climatic factors, and lack of under drainage. Fertilizers do not seem to be concerned and there is no evidence of the presence of a parasite.

OLLIVER (MAMIE) & RENDLE (T.). **A new problem in fruit preservation. Studies on Byssochlamys fulva and its effect on the tissues of processed fruit.**—*Journ. Soc. Chem. Ind.*, liii, 22, pp. 166T–172T, 1934.

Until recently the occurrence of *Byssochlamys fulva* on processed fruits [*R.A.M.*, xiii, p. 388] was believed to be strictly localized, but further investigations have shown it to be widespread on fruits grown and packed throughout England, where it constitutes an important problem of fruit preservation.

The fungus is readily cultivable on potato extract agar with inorganic salts and 10 per cent. sugar, a whitish to tawny-brown, powdery, spreading growth being produced in 48 to 72 hours at 28° to 37° C. (optimum 30° to 37°). The capacity of the fungus for sugar inversion is shown by the increase of invert sugar on Czapek-Dox solution with 9 per cent. sucrose from 1·45 per cent. after 7 days to 7·46 after 14. The maximum concentration of sucrose tolerated by *B. fulva* was found to lie between 60 and 65 per cent. Experiments with citrus and apple pectin showed that pectin is broken down by the fungus, the process of disintegration being accelerated by the addition of inorganic salts, especially in the presence of 1 per cent. peptone.

Observations have been made on the rate and manner of disintegration of various fruits packed in water and syrup, processed under commercial conditions, and inoculated with *B. fulva*. Yellow and Purple Pershore plums are readily attacked, especially if packed in water alone, and usually show extensive disintegration in two to three weeks; syrup exercises a retardatory effect on this process. Victoria plums resist the action of *B. fulva* longer than the Pershores, while damsons and greengages, though softening rapidly, retain their shape for a considerable period. Processed gooseberries become soft and broken, but the only obvious sign of fungal infection is the presence of an occasional mycelial fragment on the fruit near the surface of the container. Other fruits liable to rapid decomposition by *B. fulva* are peaches, pears, cherries, apricots, apples, and strawberries. No appreciable gas production appears to accompany the development of *B. fulva*, the acidity due to which is also very slight and imperceptible to some palates. Wounding was found to be a necessary condition for the infection of ripening fresh fruit.

The presence of *B. fulva* has been detected in at least 16 different fields or orchards on farms at a fair distance apart, and its prevalence on strawberries, which are readily contaminated by soil, suggests the latter as a probable habitat. This supposition was recently substantiated in one case where the fungus was isolated from the soil round diseased, stunted strawberry plants the fruit of which had been infected in the previous summer. Black currants, loganberries, and blackberries have been found

infected by *B. fulva* at the Campden Research Station. The fungus appears to be unknown in America and in European countries outside England.

The effects of environmental factors on *B. fulva* were studied with a view to its possible control. The growth of the fungus was inhibited even after several months by cold storage at 10° to 20° F., but the organism was not destroyed. The ascospores were found to withstand a temperature of 86° to 88° C. for 30 mins. in plum, strawberry, gooseberry, and raspberry syrups, while even young cultures (under ten days) survived 57° for the same length of time. A desiccated culture kept for a year at 37° was found to be still viable and resisted 30 minutes' heating at 82° in plum syrup, and steaming for 2 to 3½ minutes at 100° was necessary to kill the mature asci. The fungus was shown to tolerate up to 50 parts of sulphur dioxide per million in saline and plum syrup, while growth was only temporarily inhibited by ten days' exposure to ammonia (2·5 mol. of 0·88 sp. gr. per l.) and acetaldehyde (1 in 200) at freezing point, room temperature, and 37° [cf. ibid., xii, p. 46; xiii, p. 112]. *B. fulva*, although not completely anaerobic, is capable of growth under greatly reduced oxygen tension. It develops at a P_H range of 2 to 7, with an optimum about 3; the addition of citric, tartaric, and malic acids to Czapek-Dox and potato extract-sucrose cultures at concentrations up to 1 per cent. slightly accelerated growth, while those between 1 and 6 per cent. somewhat delayed it. *B. fulva* proved highly resistant to alcohol, old cultures remaining viable after 30 weeks' immersion in a 100 per cent. solution. Control measures in the factory must be based on the comparatively easy destruction of the fungus in its early stages (before the formation of the highly resistant ascospores), and in this connexion rapid handling is of the utmost importance. Intensive work is essential, however, on field control, especially in view of the facts that the fungus is certainly more widespread than was hitherto believed and probably on the increase under natural conditions.

BERKELEY (G. H.). **Strawberry root rot.**—*Ann. Rept. East Malling Res. Stat. 1st Jan. 1933 to 31st Dec. 1933*, pp. 154–155, 1 pl., 1934.

After pointing out that field observations show strawberry root rot [*R.A.M.*, xiii, p. 454] to be present in many plantations in Great Britain, the author states that inoculation tests with an infusion of macerated diseased roots or with soil from an affected plot resulted in the production of definite lesions on the roots. Isolations from lesions on affected roots gave numerous fungi, the commonest being *Coniothyrium* [ibid., xiii, p. 173], *Hainesia*, *Ramularia*, and species of *Fusarium*; inoculations with pure cultures of the first and third of these gave strongly and weakly positive results, respectively.

PLAKIDAS (A. G.). **The mode of infection of Diplocarpon earliana and Mycosphaerella fragariae.**—*Phytopath.*, xxiv, 6, pp. 620–634, 4 figs., 1934.

This is an expanded and tabulated account of the writer's studies on the mode of infection of strawberries by *Diplocarpon earliana*

and *Mycosphaerella fragariae*, a summary of which has already appeared [*R.A.M.*, xi, p. 463]. *D. earliana* penetrates the lower surface of the leaves between the epidermal cells and passes directly to the mesophyll without forming any subcuticular layer. Entry through the stomata or across the epidermal cells was never observed. In subsequent growth the mycelium remains intercellular, but haustoria are rarely if ever formed except in the peduncles, where they are abundant. Haustoria or intracellular hyphae were not observed in *M. fragariae*. There was no correlation between susceptibility to infection and the number of stomata.

MARTYN (E. B.). **A note on Plantain and Banana diseases in British Guiana with especial reference to wilt.**—*Agric. Journ. Brit. Guiana*, v, 2, pp. 120–123, 1934.

After an extensive tour of the banana-growing areas of British Guiana representatives of the United Fruit Company expressed the opinion that the symptoms of the wilt of bananas and plantains present in the colony [*R.A.M.*, viii, p. 390; x, p. 362] are identical in the majority of cases with those of the Trinidad 'moko' disease due to *Bacterium solanacearum* [see above, p. 684]. The greyish-white ooze characteristic of *Bact. solanacearum*, which appeared on cutting an affected fruit stalk, gave on isolation a bacterium with the typical reactions of this organism. Apparently, however, wilting may be caused or at least aggravated by various factors, diseased suckers containing secondary organisms which mask the real parasite. The symptoms which have been observed on Cayenne (Gros Michel), Giant Fig (Lacatan), Lady's Finger, and Dwarf bananas, and on Maiden (White) and Horse (Giant) plantains vary somewhat, but the outer leaves are generally brown and shrivelled and hang down beside the pseudostem, while the crown of younger leaves remains green. Similar symptoms are also found in plants suffering from poor cultivation in heavy soil, particularly after a dry period. The intermediate stage of yellowed leaves found in Panama disease (*F.* [*oxysporum*] *cubense*) is generally absent. If the wilted plants fruit the fingers are stunted, under-developed, and tend to turn black; the crown wilts and collapses, and the whole plant dies. The suckers show a reddish-brown to yellow discoloration of the vascular bundles, which in fruiting plants passes into the fingers. As *F.* [*oxysporum*] *cubense* has only occasionally been isolated from diseased plants the local strains of this fungus are probably less widespread and virulent than those found elsewhere.

Specifications and methods of analysis for certain insecticides and fungicides.—*Min. of Agric. and Fish. Bull.* 82, 10 pp., 1934.

As a result of discussions between representatives of the National Farmers' Union, the insecticide and fungicide manufacturers, and the Ministry of Agriculture, the Association of British Insecticide Manufacturers undertook to bring up to date the specifications for insecticides and fungicides published in the Ministry's Advisory Leaflet No. 9 and to add new ones. These last have been accepted

by the Government Chemist, the National Farmers' Union, and the Ministry; members of the Association of British Insecticide Manufacturers and certain other firms have agreed to conform to these standards, and purchasers of the materials in question are strongly advised to require a guarantee that they comply with the specifications. Agreed methods of analysis which have been drawn up in connexion with these specifications are described.

The new specifications [which are given] include, amongst others, those for lime-sulphur solution, copper sulphate, Bordeaux and Burgundy powder, Cheshunt compound [*R.A.M.*, i, p. 373], and formaldehyde.

[A shorter version of this paper appears in *Journ. Min. Agric.*, xli, pp. 225–228, 1934.]

DULAC (J.). **Utilisation des propriétés du sulfure de cuivre.** [The utilization of the properties of copper sulphide.]—*Comptes rendus Acad. d'Agric. de France*, xx, 19, pp. 650–652, 1934.

Copper sulphide, being practically insoluble in water, adheres well to herbaceous plant organs; it oxidizes rapidly on contact with air to produce copper sulphate, the intensity of this process increasing *pari passu* with the rising humidity and temperature which favour vine mildew [*Plasmopara viticola*]; and its oxidation products, being pure copper salts, possess the maximum degree of toxicity towards the fungus [*R.A.M.*, xiii, p. 423], a property that is not shared by ordinary disinfectant mixtures. Copper sulphide and its oxidation products have not been found to scorch the foliage of treated vines. The results of experiments at the Montpellier Agricultural College have demonstrated the utility of these compounds in the treatment both of vine mildew and shot hole of peach [*Clasterosporium carpophilum*].

A. (G.). **L'emploi de l'argile colloïdale dans la préparation des produits anticryptogamiques.** [The use of colloidal clay in the preparation of fungicidal products.]—*Rev. Prod. Chim. et Act. Scient.*, xxxvii, 9, pp. 260–264, 1934.

This is a slightly abbreviated translation of A. S. McDaniel's recent paper entitled 'Colloidal bentonite-sulfur. A new fungicide', a notice of which from the original source has already appeared [*R.A.M.*, xiii, p. 528; cf. also next abstracts].

FYFE (H. E.). **Bentonite and its occurrence in New Zealand.**—*New Zealand Journ. of Sci. & Techn.*, xv, 6, pp. 386–394, 3 figs., 1934.

An account, based on a study of the relevant literature supplemented by an analysis of samples from Waitangi Hill, 25 miles north-west of Gisborne, New Zealand, is given of the nature, origin, and commercial uses (actual and suggested) of bentonite, defined by Ross and Shannon (*Journ. Amer. Ceram. Soc.*, ix, p. 77, 1926) as 'a rock containing 75 per cent. or more of the crystalline clay-like materials, montmorillonite or biedellite' [see preceding and next abstracts].

Bentonite: properties, sources, geology, production, uses.—*Silica Products Co., Kansas City, Missouri, Bull.* 107 (Revised edn.), 40 pp., 19 figs., 4 graphs, 2 maps, 1934.

Bentonite [see preceding abstracts], here defined as 'a natural hydrous silicate of alumina having the distinctive property of forming a homogeneous and highly viscous solution, gel or sol, in the presence of not less than ten times its weight of water', with the chemical formula $Al_2O_3 \cdot 4SiO_2 \cdot xH_2O$, is discussed under the following aspects: physical properties, identification, geographical occurrence, geologic origin, methods and extent of production (20,000 tons from Wyoming in 1933), and special uses, e.g., as a fungicidal adjunct.

Ein neuer Dämpfer für Erddesinfektion. [A new steamer for soil disinfection.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 22, p. 281, 1 fig., 1934.

A simple and economical steamer for soil sterilization, known as 'Akra', has recently been put on the market by the Kyffhäuser foundry, Artern. It holds some 2 cwt. of soil and excessive evaporation is obviated by a detachable lid.

ISFORT (A.). **Praktische Einrichtung für das Dämpfen von Erde und Töpfen.** [A practical contrivance for the steaming of soil and pots.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 22, p. 281, 1 fig., 1934.

A note is given on the excellent performance of the 'Alfa' steamer for soil sterilization [*R.A.M.*, xii, p. 460], the manipulation of which may be still further simplified by the installation of a crane and pulley, easily workable by a 15-year-old boy.

Actes et documents officiels. [Acts and official documents.]—*Agron. Colon.*, xxiii, 197, p. 152, 1934.

FRENCH CAMEROON. A local decree of 17th February, 1934, regulates the organization of the newly established phytopathological laboratory at Douala and defines its functions in respect of the study of plant diseases and control measures. The services to be performed by the director of the laboratory include the supervision of the phytosanitary and quarantine systems and the compilation of a list of diseases of cultivated plants in the Cameroons.

Records of agricultural projects known to have failed through plant diseases.—*Plant Disease Reporter*, xviii, 2, pp. 1–16, 1934. [Mimeographed.]

At the instance of the Plant Disease Survey a number of experienced plant pathologists have supplied notes on the partial or total failure of entire crop projects in various parts of the United States through the agency of diseases for which no adequate control measures are known or where the cost of treatment renders the crop uneconomic. Numerous striking cases in which the disease factor has rendered the cultivation of the crop unduly hazardous in particular districts are mentioned.

RENOUF (L. P. W.). **Zostera disease on the coast of County Cork, I.F.S.**—*Nature*, cxxxiii, 3372, p. 912, 1934.

In the summer of 1932 the extensive *Zostera* meadows in Castle Haven, County Cork, Irish Free State, were observed to be less luxuriant than usual, and a year later they had disappeared [*R.A.M.*, xiii, p. 646]. A similar decline was noticed in Lough Ine in December, 1933, followed some two months later by disappearance. During the spring of 1934 an extensive resumption of growth was seen to be taking place over a large part of the affected areas. Interesting features of the disease in southern Ireland are the slowness of its progress, requiring a period of two years to travel six miles, and the rapidity of recovery, at any rate in the later affected districts. At Castle Haven there is stated to be no renewal of growth, with the result that the numbers of flatfish are diminishing. *Z. marina*, *Z. nana*, and a hybrid are all affected by the wasting disease in County Cork.

MOUNCE (IRENE) & DIEHL (W. W.). **A new Ophiobolus on Eelgrass.**—*Canadian Journ. of Res.*, xi, 2, pp. 242–246, 9 figs., 1934.

No adequate explanation being available for the almost complete disappearance of eelgrass (*Zostera marina*) from the western Atlantic coast of North America, as well as in parts of Europe [see preceding abstract], it is considered advisable to record the detection at St. Andrews, New Brunswick, in September, 1933, of a hitherto unknown fungus on this host. The organism, which is named *Ophiobolus halimus* Diehl and Mounce n.sp., described in English and Latin, illustrated, and compared with related species, was collected on rhizomes and fertile shoots and developed on leaves kept in sea water in the laboratory.

O. halimus is characterized by sparse, intramatrical, sphaeroid, blackish-brown perithecia, 240 to 435 μ in diameter, with one or more rostrate ostioles, the beaks being conoid, acute, blackish, and up to 278 μ long by 260 μ in basal diameter; and arcuate-fusoid, subsessile, aparaphysate asci, 270 to 300 by 12 to 15 μ, containing eight filiform, acicular-arcuate to spring-like spiral ascospores, 260 to 308 by 2 to 4 μ, terminating at the attenuated tip in a hyaline appendix up to 3 by 1·3 μ.

NICOLAS (G.) & AGGÉRY (Mlle B.). **Notes mycologiques et phytopathologiques.** [Mycological and phytopathological notes.]—*Bull. Soc. Hist. Nat. Toulouse*, lxv, 3, pp. 506–507, 1933. [Received May, 1934.]

Garlic in the market-gardens of Toulouse is stated to be attacked in a destructive form by *Sclerotinia libertiana* [*S. sclerotiorum*] which covers the bulbs with a white mould bearing numerous minute, black sclerotia; by the end of May the plant bases are withered and the bulbs are beginning to decay. The fungus is a very dangerous parasite owing to its longevity in the soil and its polyphagous character [*R.A.M.*, v, p. 269] and the transference of the garlic cultures to fresh ground may well become imperative.

Zaghouania phillyreae completes its entire life-cycle on *Phillyrea media*, forming uredospores all the year round on the leaves and branches, which become hypertrophied and shrivel, teleutospores

from February to April, and aecidia with aecidiospores and a few spermogonia in May to June. *P. latifolia* bears only a few aecidia and *P. angustifolia* some aecidia and uredospores under Toulouse conditions, although they were reported by Dumée and R. Maire in 1901 to be equally affected with *P. media* in Corsica.

DUFRÉNOY (J.) & DUFRÉNOY (M. L.). **Cytology of plant tissues affected by viroses.**—*Phytopath.*, xxiv, 6, pp. 599–619, 17 figs., 1934.

A summary and discussion are given of the results of experiments and observations by the first-named writer and others on the cytological modifications undergone by plant tissues affected by virus diseases. Many of the papers referred to have been noticed in this *Review*.

CURZI (M.). **Proprietà e natura dei virus delle piante.** [The properties and nature of plant viruses.]—*Riv. di Biol.*, xvi, 2, pp. 335–352, 1934.

After reviewing the essential characters of the plant viruses as described in the relevant literature [much of which has been noticed from time to time in this *Review*], the author discusses from a critical standpoint the three theories that have been advanced in explanation of their nature, namely, autocatalytic, microbial, and ultra-microbial [*R.A.M.*, xiii, pp. 588–589]. In his opinion, some of the virus diseases attributed to ultra-microscopic organisms are actually due to the filterable forms of microbes—a phase assumed by the latter to facilitate the penetration and infection of living cells and to assist in overcoming the defences of the host tissues.

ASAI (T.). **Über das Vorkommen und die Bedeutung der Wurzelpilze in den Landpflanzen.** [On the occurrence and significance of the root fungi in land plants.]—*Japanese Journ. of Botany*, vii, 1–2, pp. 107–150, 13 figs., 1934.

The writer's extensive investigations in Japan showed that mycorrhizal formation is a very common feature of land plants, very few of which seem to be exceptions to what is evidently a general phenomenon. A list is given of some 17 Pteridophytes and Gymnosperms in which the writer found mycorrhiza, nearly always endotrophic. These include the sporophyte of several ferns and the ordinary roots of *Cycas revoluta*. Of the very large number of monocotyledons and dicotyledons examined, a high proportion had mycorrhiza, the endotrophic being the more common in the latter and the only type observed in the former group. In general the higher classes in systematic position were the most regularly infected with endophytes. *Casuarina equisetifolia* had the fungal endophyte in its ordinary thin roots in addition to its well-known bacterial nodules [*R.A.M.*, xii, p. 583]. Weeds belonging to the Polygonales and Centrospermae were never found to bear mycorrhiza, nor were any found on the Cyperaceae, Araceae, Commelinaceae, Juncaceae, Urticaceae, Nymphaceae, and Cruciferae examined. Altogether endotrophic mycorrhiza were found in about 82 per cent. of the very large number of families examined.

Extensive notes are given on the distribution of mycorrhiza in different plant formations. Amongst the cultivated Gramineae endotrophic mycorrhiza were found in sorghum, oats, barley, wheat, maize, *Panicum crus-galli* var. *frumentaceum*, *P. miliaceum*, and *Setaria italica*.

The endophytes may be divided into two structural types, namely, one widely distributed in the roots of a large number of land plants, concentrated mainly in cell layers next the endoderm, avoiding the epidermis, and with main hyphae 5 to 7 μ in breadth, while the other, practically restricted to the Diapensiales and Ericales, is found mainly in epidermal cells and has hyphae only 2 to 3 μ in diameter. This last type is more nearly related to the ectotrophic form. The special type of endophyte found in the Orchidaceae is believed to have developed from the second type as seen in *Pyrola japonica*. Growth in water is adverse to mycorrhizal production and even species that form mycorrhiza on land (e.g., rice) fail to do so when growing in water. Except for this, no other environmental factor inhibiting mycorrhiza formation was observed. Mycorrhizal infection takes place four to five weeks after the germination of the seed, penetration being effected through the epidermis of the slender roots. The fungus may survive for more than a year by means of a residue of hyphae escaping ingestion by the higher symbiont. The mycorrhizal fungus is virtually confined to the root hair zone of the slender roots, through which it is supplied with a portion of the nutrients assimilated by the host and further enabled to utilize materials from the soil not directly available to the higher symbiont. As the roots continue their development the fungus is dissolved and undergoes ingestion by the host [cf. ibid., xiii, p. 590].

MATTIROLO (O.). **Rapporti simbiotici sviluppatisi tra il Tartufo 'Bianchetto' (Tuber borchii Vittadini) ed i Pioppi americani detti canadesi.** [Symbiotic relations developed between the small, white truffle (*Tuber borchii* Vittadini) and the American (so-called Canadian) Poplar.—*Ann. R. Accad. Agric. Torino*, lxxvi, pp. 3–10, 1934.

Tuber borchii, a small, white truffle with a considerable market value in Italy during the spring and summer [cf. *R.A.M.*, xii, p. 486], has been found in close association with poplar (*Populus canadensis*) roots in two localities of Piedmont. Although the host has been acclimatized in Italy for about a hundred years, the occurrence of truffles on its roots appears to be quite a new development.

CAPPELLETTI (C.). **Il problema immunitario nei vegetali in rapporto con l'agricoltura.** [The problem of plant immunity in relation to agriculture.]—*Ann. R. Accad. Agric. Torino*, lxxvi, pp. 91–111, 1934.

An outline is given in general terms of the problems connected with immunity in agricultural plants from parasitic fungi (with reference also to symbiosis in the Orchidaceae). Most of the investigations discussed have been noticed from time to time in this *Review*.

CORNELI (E.). **Temperature di germinazione di spore fungine in relazione alle infezioni sugli ospiti.** [Temperatures of germination of fungal spores in relation to infection of the hosts.] —*Nuovo Giorn. Bot. Ital.*, N.S., xli, 1, pp. 121–133, 1934.

As a result of comparative experiments [some details of which are given] the author found that while the spores of *Fusarium herbarum*, isolated from rotting carnation stems [*R.A.M.*, xiii, p. 515], germinated at temperatures ranging from 8° to 34° C., with an optimum at 25° to 26°, indications of parasitism of the fungus on living, artificially infected carnation stems could only be obtained at about 20° to 26°, the aggressiveness of the fungus increasing (from nil at 12° to 14°) as the temperature approached the optimum point for germination of the spores, and rapidly decreasing at 31° to 32° and above. Similarly with *Erysiphe graminis*, the spores of which germinated between 5° to 6° and 26° to 27°, with an optimum at 18° to 20°, the maximum attack of the fungus on barley seedlings in controlled tests was obtained at temperatures close to the optimum for germination, infection failing to establish itself at temperatures round about the two extreme points of the range. These results are considered to indicate that temperature is the chief factor determining the capacity of these fungi for overcoming the natural resistance of the hosts to their establishment in the tissues.

TROTTER (A.). **La degenerazione della Patata e le malattie da virus.** [Potato degeneration and virus diseases.]—*Ricerche, osservazioni ed divulgazioni fitopatologiche per la Campania ed il Mezzagiorno* (*Portici*)—issued by R. Lab. Pat. Veg., Portici, iii, pp. 18–48, 3 pl. (1 col.), 2 figs., 1934.

In this lucid and succinct review of the information at present available on potato virus diseases the author, after briefly noting the more salient field symptoms of the various types of potato mosaic [*R.A.M.*, xii, p. 648] and leaf roll [ibid., vi, p. 633; xi, p. 668], witches' broom [ibid., xii, p. 48], pseudo-net necrosis [ibid., x, p. 746; xii, p. 319], and concentric necrosis (considered to be the same as internal brown or rust spot and spraing) [ibid., xiii, p. 649], describes and discusses the classifications of potato virus diseases based by Quanjer [ibid., xi, p. 394] and Schander and Bielert [ibid., vii, p. 460] on necrotic tissue changes, and by Elze [ibid., x, p. 813] on transmissibility by insects. In the section dealing with prevention and control he summarizes different methods devised by various workers to ascertain the degree of degeneration present in the tubers [ibid., x, p. 543; xi, p. 395; xii, p. 239; xiii, p. 649]. A bibliography of 49 titles is appended.

OPITZ (K.), TAMM (E.), GOEPP (K.), RATHSACK (K.), & SOLTAU (F.). **Beiträge zur Kartoffelbau, insbesondere zum Abbauproblem.** [Contributions to Potato cultivation, especially in connexion with the degeneration problem.]—*Landw. Jahrb.*, lxxix, 5, pp. 737–781, 1 fig., 9 graphs, 1934.

A comprehensive, fully tabulated account is given of the writers' five years' experiments at the Berlin-Dahlem Agricultural Institute

on various aspects of potato cultivation, with special emphasis on the problem of degeneration.

Different varieties were found to respond in a totally divergent manner to the highly unfavourable environmental conditions of the locality. Modrows Blaupunkt, for instance, merely gave an expression of extreme nutritional deficiency without definite pathological symptoms, whereas in other cases leaf roll, mosaic, dwarfing, or a combination of these and other manifestations were visible.

It was found that the tendency to degeneration contracted under the adverse conditions at Dahlem could be readily counteracted by transference, even for one season, to the relatively favourable environment of Bornim (Potsdam), with a somewhat less sunny, cooler, and more humid climate.

No support was forthcoming for Klapp's theory that degeneration is a consequence of excessive demands on the productivity of the plant [*R.A.M.*, xiii, p. 178]. On the contrary, some of the highest yielding varieties in these tests, e.g., Ackersegen, Cellini, and Sickingen, maintained their tendency to give high yields even when grown in the area subject to degeneration.

NIELSEN (O.). **Kartoffelsorter og Kartoffelsygdomme. Fortsatte orienterende Undersøgelser.** [Potato varieties and Potato diseases. Preliminary investigations continued.]—*Tidsskr. for Planteavl*, xl, 1, pp. 105–118, 3 figs., 1934.

In continuation of previous investigations at Lyngby, Denmark, on the reaction to leaf roll and mosaic in a number of standard potato varieties [*R.A.M.*, xii, p. 715], five were placed in the resistant group for leaf roll (0 to 10 per cent. infection), viz., Imperia, Ackersegen, Field Marshal, Beveländer, and Industrie; only Ackersegen and Beveländer are also resistant to mosaic. Susceptibility to leaf roll (10 to 85 per cent. infection) was shown by Alpha, Erdgold, King Edward, Karma, Di Vernon, British Queen, Procentragis, Early Eclipse, and Sharpe's Express, while heavy infection (85 to 100 per cent.) was recorded on Duke of York, Gelkaragis, Birgitta, Preussen, and Golden Wonder (the yield of which was reduced by 82 per cent.). The ten varieties Di Vernon, Duke of York, Early Eclipse, Sharpe's Express, Ackersegen, Beveländer, Birgitta, British Queen, Golden Wonder, and King Edward are resistant to mosaic, while Alpha, Erdgold, Field Marshal, Gelkaragis, Imperia, Industrie, Karma, Preussen, and Procentragis are susceptible.

Based on tuber examinations, Beveländer, Erdgold, and Karma showed a high degree of resistance to late blight (*Phytophthora infestans*), with a maximum of 1 per cent. infection; fair resistance (1 to 3 per cent.) was shown by Ackersegen, Procentragis, Birgitta, Alpha, Preussen, Gelkaragis, and Golden Wonder; while over 10 per cent. infection, denoting great susceptibility, was recorded on Industrie and Di Vernon. Beveländer and Ackersegen are thus relatively resistant to the two virus diseases and blight.

The incidence of infection by *Rhizoctonia* [*Corticium*] *solani* was found to range from 27·1 and 27·7 per cent., respectively, on the two very late varieties Alpha and Ackersegen to 75·1 per cent. on the early King Edward. These figures, however, appear to be

correlated rather with the stage of maturity reached at the period of sclerotial development (round about 10th September) than with any inherent differences in varietal reaction to the fungus.

Scab (*Actinomyces* spp.) [including *A. scabies*] occurs only in a comparatively mild form in the Lyngby district, but as far as can be judged under local conditions the most resistant of the test varieties is King Edward (average of 1·4 per cent. in four years) and the most susceptible Industrie (4·1).

Wart disease (*Synchytrium endobioticum*) continues to spread notwithstanding all efforts to check it [ibid., ix, p. 671; x, p. 816; xi, p. 768]. Varietal tests in respect of this disease have not been carried out in Denmark, where reliance is placed on English and German wart-immunes. Of these Ackersegen and Erdgold are outstanding by reason of their productivity and resistance to late blight and scab.

BARTON-WRIGHT (E. C.), COCKERHAM (G.), & M'BAIN (A. M.). **Virus disease research.**—ex *Rept. Director of Res. Scottish Soc. Res. in Plant Breeding Ann. Gen. Meeting 26th July, 1934*, pp. 15–17, 1934.

Four of the potato varieties used in field tests at the Corstorphine Station and Ainville Sub-Station of the Society for resistance to leaf roll [see preceding abstract] showed a marked capacity to withstand the disease, namely, Shamrock, Cardinal, Chance, and Kepplestone Kidney. Of these the first-named had already manifested a superior degree of resistance in grafting experiments, and a number of crosses have been made between it and certain susceptible types, while natural selfs have also been obtained.

At Huntly Sub-Station [Aberdeenshire] the study of hereditary and virus-induced degeneracy in potato progenies has been continued, with particular reference to the development of 'seedling leaf roll' in progenies arising from parents carrying individual viruses and virus complexes. The number of plants of the 'seedling leaf roll' type appearing in such progenies was shown to be correlated with the severity of virus infection in the parents, irrespective of the virus concerned. Metabolic disturbances in the virus-diseased parents are believed to cause degeneracy of this sort in individual members of the progeny.

BLACK (L. M.). **The Potato yellow dwarf disease.**—*Amer. Potato Journ.*, xi, 6, pp. 148–152, 1934.

The writer was informed by E. S. Schultz in correspondence that in 1930 the latter obtained transmission of yellow dwarf of potatoes [*R.A.M.*, xii, p. 187] by grafting diseased Green Mountains on healthy Bliss Triumphs in 11 out of 25 cases. In the winter of 1931–2 the writer was also successful in transmitting the disease by grafting in 57 out of 61 plants, the incubation period in the greenhouse at 27° C. ranging from 22 to 61 days with an average of 38. In subsequent tests under different conditions a minimum incubation period of 17 days was recorded. In New York State the earliest symptoms of yellow dwarf are usually observed about the last week in July. The clover leaf hopper, *Agallia sanguinolenta*, was found to act as a vector of yellow dwarf. Overwintering

adults on grass land were shown to be viruliferous, so that the infective principle must either reside in the insects themselves or in some plant other than potato.

HILL (HELEN D.). **A comparative study of certain tissues of giant-hill and healthy Potato plants.**—*Phytopath.*, xxiv, 6, pp. 577–598, 1 fig., 8 graphs, 1934.

Measurements of stem lengths and leaf counts of giant-hill potato material [*R.A.M.*, xii, p. 48; xiii, p. 534] in Pennsylvania confirmed field observations on the relative constriction of diseased as compared with healthy tops. The leaves of affected plants were thinner than those of healthy ones, the percentage reduction being 4·92 and 13 in 1930 and 1932, respectively. The palisade mesophyll cells of giant-hill potato leaves were considerably narrowed and somewhat shorter than those of healthy plants. In the petioles of diseased plants the inner phloem was slightly more abundant than in those of healthy ones, and somewhat more extensive in relation to the xylem, while the outer phloem was rather scanty in the affected tissues. On the other hand, the stems of giant-hill plants contained considerably less inner phloem than healthy ones, the percentage reduction being 23·35 in 1930 though less marked in 1932. In the affected stems the inner phloem was also less abundant in relation to the xylem than in healthy ones. No differences could be detected in the individual cell elements of xylem or phloem between diseased and healthy plants. These results may be interpreted as indicating a disorganization of the photosynthetic and conducting tissues in giant-hill plants of a comparable order to those characteristic of certain other virus diseases of the potato, though relatively mild in expression.

CRISTINZIO (M.). **La 'necrosi del cuore' dei tuberi di Patata.** [Heart necrosis of Potato tubers.]—*Ricerche, osservazioni ed divulgazioni fitopatologiche per la Campania ed il Mezzogiorno (Portici)*—issued by R. Lab. Pat. Veg., Portici, iii, pp. 3–17, 2 pl., 3 figs., 1934.

From 1930 onwards, up to 70 per cent. of individual consignments of apparently healthy Böhms seed potatoes imported into Italy showed, when cut, sparse, light rusty spots (often surrounded by a transparent halo) in the centre of the flesh, converging into darker spots which in turn merged into a reddish-brown to dark brown, occasionally zonate, area up to 2 cm. long by about 1 cm. wide; this frequently broke down to form a cavity in which the dead tissues formed dark, compact masses adhering to, or detached from, the walls. The condition, which was very occasionally observed on other varieties from Germany, Holland, England, Poland, and Esthonia, closely corresponded macroscopically and microscopically with heart necrosis [*R.A.M.*, xii, p. 784] and internal hereditary spotting [ibid., xii, p. 319]. It was distinct from black and hollow heart [ibid., xi, pp. 357, 535].

Histological examination showed that as the affected cells became necrosed a suberized layer formed around the whole or a part of the necrosed area, cork formation ceasing when the necrosis became arrested. The formation of the cavity was mainly due to the

suberized zone interrupting the nutritional exchange between the healthy and affected tissues, the latter becoming detached and dying.

When affected and healthy imported Böhms tubers were planted the yield from the former though apparently equal in quantity and quality with that of the latter showed 10 to 75 (average 33) per cent. affected tubers. In a further test with imported Böhms seed tubers and others grown in Italy from imported seed of the same variety the former gave 27 and the latter 43 per cent. affected potatoes, indicating that the proportion of the progeny to become affected increases with each planting. In both tests the necrosis sometimes began while the tubers were very young, becoming fully evident only at maturity. As cavities were seldom noted, they probably develop in storage and are not necessarily symptomatic.

The author attributes the disease to the action of a virus and considers it to be a localized form of hereditary internal spotting probably associated with the particular susceptibility of the Böhms variety. It should be placed in category V (pseudo-net necrosis) of Quanjer's classification [ibid., x, p. 746].

A bibliography of 17 titles is appended.

NĚMEC (A.). **Über die Zusammensetzung der Mineralstoffe einiger krebsfester und gegen Krebs anfälliger Kartoffelsorten. (Vorläufige Mitteilung.)** [On the composition of the mineral substances of some wart-resistant and wart-susceptible Potato varieties. (Preliminary note.)]—*Die Phosphorsäure*, iv, 6, pp. 352–357, 1934.

A tabulated account is given of the writer's preliminary studies at the Biochemical Institute of the Prague Agricultural Experiment Stations on the mineral composition of the tubers of four potato varieties resistant to wart [*Synchytrium endobioticum*], namely, Modrows Preussen, Viktoria, Hindenburg, and Kěrkover Kidney as compared with the same number of susceptible ones (Erstling [Duke of York], Böhms Erfolg, Kěrkover Industrie, and Deutschbroder Kidney).

Little difference could be detected in the ash content of the two groups, except for a general tendency to deficiency in potash in the tubers of the susceptible varieties. The latter, however, showed much greater fluctuations in the lime content (1·48 to 3·15 per cent. calcium oxide) than the resistant group (2·12 to 2·48 per cent.). The resistant varieties were found to be much higher in magnesium oxide (6·22 to 9·87 per cent.) than the susceptible group (4·51 to 5·5 per cent.), while manganese was also more plentiful in the former than in the latter, with the exception of Böhms Erfolg. The ratio of magnesium to calcium oxide ranged from 2·93 to 4·44 : 1 in the resistant group, compared with 1·55 to 3·24 : 1 in the susceptible. Industrie and Hassia (susceptible) potatoes receiving 3 doppelzentner superphosphate or basic slag per hect. in addition to 1·5 doppelzentner ammonium sulphate showed an increase in the magnesium and manganese contents over those given only ammonium sulphate. In another test at the Valečov (Czecho-Moravian uplands) Experiment Station the magnesium content of the resistant tubers was found in most cases to range from twice

to four times as high as the lime. A number of varieties showed much the same mineral composition in various localities and under divergent cultural conditions.

Potato tubers actually infected by wart disease contained an abnormally high proportion of lime in relation to magnesium (ratio of magnesium to calcium oxide 0·31 : 1·37) the corresponding figures for the excrescences themselves being 0·18 : 0·32, while silicic acid also preponderated considerably both in the diseased tubers and in the warts [cf. *R.A.M.*, xii, p. 718].

CROSIER (W.). **Studies in the biology of Phytophthora infestans (Mont.) de Bary.**—*Cornell Agric. Exper. Stat. Memoir* 155, 40 pp., 11 graphs, 1934.

Continuing his studies on *Phytophthora infestans* [*R.A.M.*, xiii, p. 120], the author gives a detailed account of experiments (many of which were made in closely controlled temperature and humidity chambers) directed to investigate as many as possible of the factors involved in the host-pathogen-environment complex in the etiology of the potato blight problem [cf. ibid., xiii, p. 468]. The results [which are tabulated and shown as graphs] indicated that in pure culture on oatmeal-dextrose agar the temperature range for growth of *P. infestans* is from 3° to nearly 30° C. with an optimum at 21°, which is also the optimum for the rapidity and abundance of production of sporangia in a saturated atmosphere. On potato tuber slices [ibid., xiii, p. 120], however, the average size of the sporangia produced gradually decreased as the incubation temperature increased from 3° to 26°. At temperatures above 20° the sporangia lost their viability in from one to three hours in dry air, and in from 5 to 15 hours in moist air. The optimum temperature for indirect germination (by zoospores) of the sporangia was 12°, and that for direct germination (by germ-tubes) 24°. The duration of motility of the swarm spores ranged from 15 minutes at 24° to 24 hours at 1° to 2°; their germination occurred at all temperatures between 3° and 28°, at least 70 per cent. germinating at temperatures between 6° and 24°. Germ-tube elongation was most rapid at 21° and 24°.

In controlled experiments on potato plants more infections resulted from inoculation on the lower than on the upper leaf surface. At temperatures between 10° and 25° the mycelium resulting from the germination of the zoospores established itself in the host tissues in 2½ hours, and its spread in the tissues was most rapid at 20° to 23°. From 90 to 100 per cent. infection occurred when conditions favourable for penetration continued for a period of ten hours. The period of incubation (appearance of visible lesions) was shortest, from 66 to 82 hours, at 20° to 23°; it was 78 hours at 30° and 120 hours at 10°. In potato stems in particular *P. infestans* tolerated intermittent high temperatures up to 40°.

In some cases the severity of infection was determined by the age of the plants, young individuals being usually more severely blighted than older plants [cf. ibid., xiii, p. 468]. The apical leaves of the Yellow Globe tomato were shown to be immune from late blight, although the lower ones were very susceptible. The

relative resistance of either susceptible or highly resistant, or of early- or late-maturing potato varieties, was not altered by combinations of environmental factors, such as high temperature, dry air, and light intensity.

BONDE (R.). **Potato spraying—the value of late applications and magnesium-Bordeaux.**—*Amer. Potato Journ.*, xi, 6, pp. 152–156, 1934.

The writer's observations in Maine indicate that a large proportion of the heavy losses in the potato crops due to late blight [*Phytophthora infestans*] might be avoided by giving more late spray applications (from the last week in July to the beginning of September) and using a dolomitic or magnesium-containing lime in preference to one with a high calcium percentage [*R.A.M.*, xii, p. 391].

WEI (C. T.). **Rhizoctonia sheath blight of Rice.**—*Nanking Coll. of Agric. & Forestry Bull.* (New Series) 15, 21 pp., 7 figs., 1934. [Chinese summary.]

Rhizoctonia sheath blight was found to be one of the principal rice diseases in Kiangsu and Chekiang, China, causing 10 to 70 per cent. infection among the later varieties. The mycelial cells of the fungus responsible for the irregular straw-coloured, bluish-grey, or greyish-green lesions with brownish margins, usually occurring on the leaf sheath, measured 30 to 212 by 5 to 14 μ, the externally rough, brown sclerotia 0·50 to 3·30 by 0·30 to 2·52 mm., and the barrel-shaped sclerotial cells 15 to 51 by 10 to 27 μ. The organism is considered to be identical with that studied in 1909 by Miyake under the name of *Sclerotium irregulare* and subsequently (1912) referred to *Hypochnus sasakii* Shirai by Sawada [*Corticium sasakii*: *R.A.M.*, xiii, p. 264], as well as with the Philippine fungus determined by Palo as *R.* [*C.*] *solani* [ibid., xi, p. 1]. The author is of opinion that it may tentatively be considered to be a strain of *H.* [*C.*] *solani*. The best growth occurred between 25° and 30° C. Positive results were given by inoculation tests on cucumber, sesame, spinach, cotton, radish, cabbage, *Digitaria sanguinalis* [*Panicum sanguinale*], soy-bean, broad bean (*Vicia faba*), sorghum, barley, and [Italian] millet (*Setaria italica*), in addition to rice. Control should be based on suitable cultural practices and on the selection of resistant varieties.

YOSHII (H.). **How does Piricularia oryzae penetrate into the host?**—*Journ. Plant Prot.*, xx, pp. 841–844, 1 fig., 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vii, 1–2, pp. (29)–(30), 1934.]

An examination of fixed and stained rice leaf material inoculated with *Piricularia oryzae* [*R.A.M.*, xiii, p. 654] showed that the appressoria of the fungus may be produced on any part of the surface irrespective of the position of the stomata; from each appressorium is extruded a slender haustorial hypha capable of penetrating the cuticle. During infection the cuticle develops a callosity on the side towards the cell cavity, and each haustorial stalk ends in a small sac-shaped body situated in the cell just

beyond the callosity. Hyphae are produced by the sac and not only rapidly occupy the entire cell cavity but penetrate adjacent cells through the rupture of the walls. No evidence was observed of hyphal penetration through the stomata.

SHARPLES (A.). **Annual Report. Pathological Division.**—*Ann. Rept. Rubber Res. Inst. Malaya, 1933*, pp. 105–120, 1934.

The sole constituents of the normal root disease complex of *Hevea* rubber in Malaya are the diseases caused by *Fomes lignosus*, *Ganoderma pseudoferreum*, and *F. noxius*, all of which spread by means of a rhizomorph system [*R.A.M.*, xiii, p. 124]. These diseases are a direct legacy from the original jungle, and the fungi concerned follow a threefold life-cycle. The first stage consists in the attack by the rhizomorphs, the second in the penetration of the newly invaded root sections and the spread of the mycelium towards the centre, and the third in the production of rhizomorphs again at an advanced stage of decay of the root. Penetration of the host is independent of mechanical wounds and results from hyphae produced at the surface of contact of rhizomorph and host which penetrate readily through the healthy bark.

These root parasites have become generally distributed throughout the jungle, but while the jungle trees are growing the loss of stand never becomes serious. After felling and burning, however, the parasites are at first threatened with destruction as the rhizomorphs are unable to use dead plants as hosts, with the result that the life-cycle is broken at the end of the rhizomorph-producing phase. Except under special conditions the rhizomorphs cannot grow directly through the soil, but require a chain of solid surfaces (such as is provided by roots), and though they can spread on dead root surfaces they appear to be unable to enter and obtain nourishment from roots already colonized by other organisms.

Root disease in rubber plantations develops in two distinct stages. The first lasts for the four or five years after planting, while the roots expand to fill their respective planting sites. If a site contains rotted, infected jungle roots the rubber inevitably becomes infected and dies during this stage, which manifests itself by the gradual infection and death of patches of trees in the young stand, the limits of the patches coinciding with those of the original patches of jungle infection. The second stage begins as soon as the root systems of adjacent trees become firmly interlaced, when infection can begin to spread beyond the patches of jungle infection; this phase gives rise to the expanding patches of disease typical of mature stands.

In June, 1933, panel disease or white fan blight [ibid., iii, p. 680; ix, p. 405] occurred on two rubber estates. The whole of the affected surfaces were covered with fine, silky strands of mycelium and in advanced cases had a silvery-white appearance. The mycelial plates and strands resembled those of a *Marasmius*, and fructifications developed in the laboratory confirmed this determination; the fungus, which under certain conditions is actively parasitic, rotting the bark and cortical tissues of the newly tapped surface down to the wood, is regarded as being almost certainly *M. palmivorus* [ibid., xii, pp. 355, 507].

In the section [by F. Beeley] dealing with the rubber mildew situation in Malaya it is stated that in 1933 attack by *Oidium heveae* was unique in its suddenness and short duration. In inland areas in the States of Selangor and Perak where heavy rain fell throughout the first five months of the year, rubber estates were practically free from the disease, but in the Port Dickson (Negri Sembilan), Malacca, and Sitiawan (Perak) districts only light showers fell from February to April, and these induced an almost epidemic spread in March, when most of the trees were just growing new leaf [ibid., xiii, p. 470]. Some 3,000 acres of mature trees were dusted with sulphur, and it is estimated that in 1934 the area to be dusted will exceed 20,000 acres, almost all in the Malacca and Negri Sembilan districts.

VERONA (O.). **Studio microbiologico di un terreno torboso.** [A microbiological study of a peat soil.]—*Arch. für Mikrobiol.*, v, 3, pp. 328–337, 1934. [German summary.]

Fungi were found to be the principal micro-organisms present in a Po Valley (northern Italy) peat soil, those present including *Aspergillus glaucus*, *A. flavus*, *Penicillium crustaceum*, *P. luteum*, *Fusarium roseum*, and species of *Verticillium*, *Sclerotium*, *Trichoderma*, and *Mucor* [cf. *R.A.M.*, xii, p. 191]. The ammonia-forming and nitrogen-fixing properties of the soil were insignificant and nitrification practically absent. Denitrification, however, took place on an extensive scale and carbonic acid production was abundant.

HOERNER (G. R.). **Crown gall of Hops.**—*Phytopath.*, xxiv, 6, pp. 688–691, 1 fig., 1934.

Of 400 sexless Late Clusters hop plants rogued in Oregon in 1932 6·25 per cent. were found to show crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) infection [*R.A.M.*, x, pp. 750, 766]. Three distinct types of the disease are differentiated: (1) involving the entire crown and comparatively rare; (2) affecting the underground stem buds and causing 'hairy root'; and (3) the most prevalent form, in which the organism attacks isolated portions of the underground plant parts or a section of the crown at or near ground level. The crown gall organism was isolated from both the second and third types on Early and Late Clusters and inoculated into Fuggles and Late Clusters with positive results. From the third type an isolation was made under Dr. Riker's supervision which caused similar galls on inoculation into tomatoes.

PARK (M.). **Bacterial leaf-spot of Betel.**—*Trop. Agriculturist*, lxxxii, 6, pp. 393–394, 1 col. pl., 1934.

A brief, popular account is given of the symptoms, manner of spread, and control of the leaf spot of betel [*Piper betle*] caused in Ceylon by *Bacterium betle* [*R.A.M.*, vii, p. 741].

'Approved' varieties of Sugar Cane.—*Australian Sugar Journ.*, xxvi, 3, p. 139, 1934.

The Director of the Bureau of Sugar Experiment Stations announces certain changes in the list of sugar-cane varieties, the

cultivation of which is permissible in the areas served by various central sugar mills in Queensland. In many cases official approval is dictated by the resistance of the varieties to diseases prevalent in particular areas. Thus, the approved varieties for the Eagleby Mill area are Q. 813, N.G. 36, H.Q. 285, Korpi, and Oramboo, while owing to the heavy infestation of this area by Fiji disease [*R.A.M.*, xiii, p. 324], the cultivation there of the highly susceptible P.O.J. canes is inadmissible. All the above-mentioned varieties are resistant to Fiji disease and early maturing.

BRANDES (E. W.), TAGGART (W. G.), & CHADWICK (R. H.). **New Canes for Louisiana.**—*Sugar Bull.*, xii, 19, pp. 1–2, 1934. [Abs. in *Facts about Sugar*, xxix, 8, p. 282, 1934.]

Two new canes, C[anal] P[oint] 28/11 and C.P. 28/19, have been released for planting in Louisiana. Both are susceptible to mosaic and sheath rot [*Cytospora sacchari*: *R.A.M.*, xii, p. 114], but the former is very resistant to red rot [*Colletotrichum falcatum*: ibid., xiii, pp. 182, 595]. The new varieties are recommended as valuable substitutes for P.O.J. 234, combining as they do good ratooning qualities (deficient in the latter) with earliness. C.P. 28/19 is superior to C.P. 28/11 as regards constitution and yielding capacity.

ARTHUR (J. C.). **Manual of the rusts in United States and Canada.**—xv + 438 pp., 487 figs., 1 map, Purdue Research Foundation, Lafayette, Indiana, 1934.

In this manual, which is most conveniently arranged and easy to use, the writer has compressed a mass of information into a small space. One of the objects of the work is to assist the general botanist in the determination of rust (Uredinales) collections, while the other is to present a classification showing the phylogenetic relationship of species and genera as consistent with the present state of knowledge as lineal arrangement permits [cf. *R.A.M.*, ix, p. 344]. Species showing clear indications of descent from a common ancestor are grouped under the most completely developed member of the group, the reduced forms following under the same member though still keeping their rank as specific units. The geographical area covered comprises Greenland, Newfoundland, Canada, and the continental United States, including Alaska and the Aleutian Islands. In addition to the comprehensive annotated account of the species forming the basis of the work, lists are given of the abbreviations used for the names of authors of rusts and hosts, supplemented by explanatory notes on terms and usage, a glossary, and indices of rusts and hosts. Nomenclatural priority is taken to date from 1753, not 1801 as in Art. 19 *c* of the International Rules of Nomenclature.

ARTHUR (J. C.). **Terminologie des Urédinales.** [Terminology of the Uredinales.]—*Bull. Soc. Myc. de France*, l, 1, pp. 130–133, 1934.

This is a complete translation into French of the author's original paper on the terminology of the Uredinales, an abstract of which has already been published [*R.A.M.*, xi, p. 746].

MORQUER (R.). **Considérations biologiques sur les variations du Botrytis cinerea et spécialement sur une nouvelle forme pathogène pour les Culicides.** [Biological considerations on variations in *Botrytis cinerea* and especially on a new form pathogenic to the Culicidae.]—*Bull. Soc. Hist. Nat. Toulouse*, lxv, 4, pp. 603–617, 1933. [Received May, 1934.]

The writer points out that the heterogeneity of the genus *Botrytis* arises from an artificial grouping of conidial types of very distantly related Ascomycetes, including Discomycetes such as *Mniaecia jungermanniae* and Hypocreaceae represented by *Cordyceps*. The division of the genus into several subgenera may be provisionally retained. The delimitation of *Eubotrytis* and *Cristularia* seems to be legitimate, whereas *Polyactis* [cf. *R.A.M.*, ix, p. 691], based on insufficiently known conidiophores, should be dropped and its representatives incorporated with *Phymatotrichum*.

B. cinerea is a collective species, embracing on the one hand morphological species of the second rank, differing among themselves in morphological details and especially in their mean dimensions, and on the other biological species characterized by varying capacities of parasitism, host specificity, and virulence. A full description is given of *B. cinerea* forma *theobaldiae* [ibid., xiii, p. 233], found parasitizing the larvae of Culicidae, to which it was shown by inoculation experiments to be pathogenic. It is characterized on Hayduck's medium by ashen-grey, orange-tinted conidiophores of very variable length, 10·5 to 15·5 μ in basal diameter, producing branches 4·5 to 6·5 μ thick terminating in ampullae averaging 10·5 μ (8 to 13 μ) in diameter, covered with mucronate sterigmata bearing ovoid to ellipsoid, occasionally piriform, hyaline conidia, 11 to 14 by 6·5 to 8 μ (mean 13·4 by 7·8 μ), the dimensions of these organs on Sabouraud's agar being considerably larger (11·7 to 18 by 7·8 to 11 μ). The terminal ampulla (of which this is stated to be the first mention) is considered to be a valuable diagnostic character.

LEHMAN (S. G.). **Contaminated soil and cultural practices as related to occurrence and spread of Tobacco mosaic.**—*North Carolina Agric. Exper. Stat. Tech. Bull.* 46, 43 pp., 5 figs., 1 diag., 1934.

Carefully planned tests are stated to have shown that mosaic is the cause of much heavier losses among the tobacco crops of North Carolina than is generally realized by local growers. When the disease gains a foothold early in the season the depreciation in the yield and quality of the stand may account for a reduction of 50 to 60 per cent. or more as compared with the market value of healthy plants.

It was found that the proportion of plants contracting infection directly from infested soil was four to five times as high where the diseased plants overwintered on the land and were disked into the soil as where the stalks and roots were removed or were cut up by disking in the autumn. Ploughing diseased material under deeply in the autumn gave poorer control of initial mosaic infection, and ploughing it under in the spring rather better control,

than cutting it up with a disk in the spring. The deeply covered plants, protected from freezing by the soil cover, appear to retain sufficient vitality to produce diseased suckers whence the virus may be transferred to new plants. Autumn disking, on the other hand, uproots and mutilates the plants in such a way that they undergo considerable decay during the winter and so constitute less of a risk to the new crop. Similar treatment in the spring is less effective, since an abundance of active virus may persist in the roots of plants allowed to stand over the winter.

The spread of mosaic in young plants by chewing or smoking tobacco while handling, e.g., in weeding or transplanting, was confirmed [*R.A.M.*, xiii, p. 189] as was also spread by carelessness in topping, the incidence of infection being increased from 10·5 to 40·7 per cent. in one test and from 10·2 to 62·4 per cent. in another by indiscriminate topping of diseased and healthy plants. Mosaic is also spread extensively in the field after the plants have grown large enough to rub the implements used in cultivation. In two tests on artificially inoculated plots the amounts of infection were increased from 5·3 to 64 per cent. by two cultivations and from 5·4 to 80·8 per cent. by four, respectively, the spread occurring laterally as well as along the rows. With an initial mosaic infection of only 1 per cent., the careless grower may find 60 to 90 per cent. or more of his plants diseased by the beginning of harvest. The spread of mosaic on infested plots was effectively checked by roguing, which necessitated the removal of an average of only 1·5 per cent. of the plants on the 23 experimental plots. Tobacco should not be re-set in the places vacated by the rogued plants, contamination being probable in a large proportion of such cases.

TERNOVSKY (M. F.). **Die Fragen der Immunität bei Vertretern der Gattung Nicotiana.** [Questions of immunity among representatives of the genus *Nicotiana*.]—*Der Züchter*, vi, 6, pp. 140–144, 1934.

One of the most serious tobacco diseases in the Crimea (U.S.S.R.) is mildew (*Erysiphe cichoracearum* f. *nicotianae*) [*R.A.M.*, vii, pp. 273, 278], to which 18 representatives of *Nicotiana tabacum* and 4 of *N. rustica* (*texana*, *trigonophylla*, *jamaicensis*, and White Burley) proved susceptible in artificial inoculation experiments under controlled conditions at the Nikitsky Botanic Garden in 1932–3. Of the 18 wild and ornamental species used in the tests, only *N. glauca* and *N. sylvestris* contracted an insignificant degree of infection. The F_1 species hybrids *N. tabacum* × *N. sylvestris* and *N. tabacum* × *N. glauca* were less severely attacked than the *N. tabacum* parent, while *N. glutinosa* × *N. tabacum*, *N. tabacum* × *N. sanderae*, and *N. rustica* × *N. tabacum* remained immune from the disease. The nature and extent of the latter on *N. rustica* and *N. sylvestris* were so sharply contrasted with the symptoms on *N. tabacum* as to suggest corresponding morphological differences in the fungus, and the conidia were in fact shown by measurements to fall into two groups [details of which are not given] according to the hosts.

The importance of hybridization experiments in connexion with

the development of mildew-immune tobacco varieties is briefly discussed.

KARRAKER (P. E.) & BORTNER (C. E.). **Studies of frenching of Tobacco.**—*Kentucky Agric. Exper. Stat. Res. Bull.* 349, pp. 63–109, 7 figs., 1934.

This is a detailed and tabulated account of field and greenhouse experiments carried out for several years at the Kentucky Agricultural Experiment Station in the attempt to determine the relationships of frenching in tobacco (chiefly Burley) to soil reaction and to the supply of available plant nutrients [cf. *R.A.M.*, xiii, p. 191]. The condition was not observed to develop in soils of moderate or strong acidity (below P_H 5·8), irrespective of the supply of nutrients. At higher P_H values it developed when the amount of available nitrogen, phosphorus, and potassium, either singly or in combination with each other, was low, and sufficient additions of these elements brought about the recovery of frenched plants. It was not usually more common or more severe in heavily limed than in slightly acid soils; indeed there was some evidence that in the former there was less frenching than in neutral or slightly acid soils. It thus appeared, from nutritional-physiological considerations, that the effect of reaction on frenching was one of calcium supply, and it is suggested that the effect of calcium was mainly within the plant, possibly by affecting the translocation of protein compounds and other nutrients to the growing points.

The relation of the supply of nutrients to frenching was not so direct and consistent as the relation of this supply to growth. In the greenhouse, deficiency in nitrogen appears to play a more important part than lack of phosphorus or potassium, although the condition frequently developed in soil or sand with a high nitrate content but deficient in phosphorus or potassium. It was necessary to maintain a high level of all three elements in available form during plant growth to prevent frenching in the presence of favourable reaction for the disorder. In the field, no definite conclusions could be arrived at in regard to the relation of the supply of nutrients to frenching, but the balance of evidence indicated that a higher level of nutrients is required to prevent the trouble than is necessary to give satisfactory plant growth. In the work done no relationship could be established between frenching and the presence or absence of other mineral elements.

It is suggested that while these studies rather clearly show the condition to be related to soil reaction and nutrient supply, there may yet exist some other factors which may affect the reaction and nutrient factors, or be affected by them.

TROTTER (A.). **I disturbi funzionale e le alterazione fogliari del Tabacco.** [The functional disturbances and foliar modifications of Tobacco.]—*Boll. Tecn. R. Ist. Sperim. Coltiv. Tabacchi 'Leonardo Angeloni'*, Scafati (Salerno), xxxi, 1, pp. 13–51, 5 pl., 7 figs., 1934. [English summary.]

The writer discusses, in the light of the relevant literature and contemporary research, various types of non-parasitic disorders of tobacco leaves occurring in Italy and elsewhere, including top rot

or burnt hearts [*R.A.M.*, xiii, p. 659], frenching (of which shoestring, sword leaves, strop leaves, strap leaf, and rosette are given as synonyms) [see preceding abstract], potash hunger [ibid., x, p. 276], different forms of chlorosis, such as 'sand drown' [ibid., xii, p. 146], and 'rust' [ibid., x, p. 585]. The five photographic plates are original.

WELCH (D. S.). **Nectria canker on hardwoods in northeastern United States.**—*Plant Disease Reporter*, xviii, 2, pp. 21–22, 1934. [Mimeographed.]

Cankers caused by species of *Nectria* of the type usually referred to *N. ditissima* or *N. galligena* and to a lesser extent by those of the *N. cinnabarina* type [*R.A.M.*, xii, p. 44] or its imperfect *Tuberculariа* stage, were found to constitute the most common and serious diseases of young hardwoods in some 65 forest areas in New England and New York surveyed during 1933. A list is given of the hosts on which the first type of canker was found, including five species of *Acer*, four of birch, box (*Buxus sempervirens*), beech, ash, walnut [ibid., xii, p. 424], poplar, oak, lime, and elm.

EHRLICH (J.). **The Beech bark disease a Nectria disease of Fagus, following Cryptococcus fagi (Baer.).**—*Canadian Journ. of Res.*, x, Special Number, pp. 593–692, 9 pl., 5 figs., 12 graphs, 2 maps, 1934.

A comprehensive account, supplemented by 29 tables, is given of the author's investigations in the United States and Canada on the beech (*Fagus grandifolia*) bark disease associated with *Cryptococcus fagi* and a hitherto undescribed variety of *Nectria coccinea* [*R.A.M.*, xiii, p. 280].

While the disease in central and western Europe appears to be declining, in North America it is becoming more alarming. Since the first report of the infestation in Nova Scotia some 15 years ago, infection has steadily spread there and in southern New Brunswick, while localized attacks have occurred in Maine. In the stands examined in Nova Scotia and New Brunswick some 90 per cent. of the beeches were infected by the fungus, while in the areas invaded for a relatively long period approximately 50 per cent. of the trees had been killed at the time of observation.

The fruiting bodies of the *Nectria* develop in the areas of the trunk and branches vacated by *C. fagi*. The cells punctured by the insect collapse and this leads to the rupture of the periderm, through which the *Nectria* advances as far as the sapwood. Extensive invasion leads to the desiccation and death of the twigs and leaves, cessation of leafage, and the cracking, detachment, and ultimate shedding of large areas of the bark. On younger trees the symptoms are less severe, individual lesions often becoming surrounded by healthy bark and wood so that only depressed lesions result.

The apparently new variety of *N. coccinea* (the designation of which will be the subject of further study) concerned is characterized by globose to ovoid, clustered perithecia, mostly 200 to 300 μ in diameter, on discoid, erumpent stromata. The asci contain

eight oval to elliptical, uniseptate ascospores averaging 7·3 to 16·1 by 4·1 to 7·5 μ (mean 11·9 by 5·7 μ). The microconidia are typically unicellular, occasionally septate, and the macroconidia elongated, slightly curved, 3- to 9- (mostly 5- to 6-) septate, and 60 to 90 by 5 to 6 μ (range 48 to 125 by 4·2 to 6·6 μ). The fungus made practically no growth at 33° C.; at 27° the initial rate of development was more rapid than at laboratory temperature, but the advantage was not maintained. Ascospore discharge was found to take place at temperatures decreasing almost to freezing-point, while the macroconidia germinate at temperatures down to 3°. The maximum growth was made at P_H 8·0, with a range of 4·5 to 9·6. Spore-trap experiments showed that ascospore discharge follows rains of sufficient duration to wet the bark and continues until after the surface of the bark and perithecia appears dry; both ascospores and macroconidia are air-borne.

The evidence for the joint participation of *C. fagi* and the *Nectria* in the causation of the beech bark disease rests on (1) the constant association of both organisms with the disorder, (2) the absence of the latter when only one is present, (3) the consistent isolation of the fungus from infected tissues, and (4) the incapacity of the latter to attack any tissues other than those infested by the insect. It was experimentally shown that, in general, the fungus can only invade bark already infested by the insect for upwards of a year.

On ornamental trees the beech bark disease may be combated by the timely use of insecticides. In the forest the first step is the salvage of infected, dying, and recently killed timber, but some measure of control may be possible by natural enemies of *C. fagi* and by improved silvicultural measures.

A five-page bibliography is appended.

LEDEBOER (MARIA S. J.). **Physiologische onderzoekingen over Ceratostomella ulmi (Schwarz) Buisman.** [Physiological investigations on *Ceratostomella ulmi* (Schwarz) Buisman.]—Thesis, Univ. of Utrecht, 95 pp., 8 graphs, Hollandia-Drukkerij, Baarn, 1934. [German summary.]

These physiological studies [which are fully described and tabulated] on *Ceratostomella ulmi*, the agent of the well-known die-back of elms in Holland and elsewhere, were carried out in synthetic media with ten strains of the fungus, eight isolated by the writer from Dutch material and two supplied by Dr. C. Buisman, while an eleventh, isolated by M. Boudru at Gembloux, Belgium [*R.A.M.*, xiii, p. 335], was included in the experiments on the effects of mineral salts on the organism.

Fairly good growth was made at 8·5 C., the optimum for development being 25° and the maximum about 34°. Coremial production was favoured particularly by the ultra-violet rays of the sun (15 minutes' exposure) [cf. ibid., xii, p. 316 *et passim*]. The minimum, optimum, and maximum hydrogen-ion concentrations for the growth of *C. ulmi* were generally found to be $P_H \pm 8$, 6 to 7, and ± 5, respectively, though in the presence of peptone development was possible at P_H 3·6. The following sources of carbon were utilized: 5 per cent. saccharose (the best), glucose, maltose, lactose, galactose,

glycerine, mannite, and starch; cellulose was not attacked. Nitrogen was supplied by ammonia compounds, asparagin, and peptone. Potassium phosphate (0·1 per cent.) and potassium sulphate (0·001 to 0·01 per cent.) exerted a marked stimulatory action on the growth of *C. ulmi*, while 0·1 per cent. sodium chloride proved injurious. Magnesium was found to be an indispensable element, the minimum concentration inducing growth being 0·0015 and the optimum 0·15 per cent. Calcium exercised a favourable effect, especially in the presence of magnesium concentrations between the minimum and optimum. Zinc sulphate (0·002 to 0·02 per cent.) promoted a compact mycelial texture in contrast to the usual loose, transparent growth; at 0·1 per cent. a distinct retardation was generally observed. In minute quantities copper stimulated development, a similar effect resulting from the addition to the medium of manganese carbonate or sulphate. At low concentrations (not exceeding 0·001 to 0·01 per cent.) mercuric chloride also activated the growth of *C. ulmi*.

None of the elements used in these investigations can be considered from the standpoint of practical control, since the concentrations at which they harm the fungus are too high to be safely applied to the host.

The Dutch Elm disease.—*Science*, N.S., lxxix, 2058, pp. 516–517, 1934.

The number of elms in the United States found to be affected by die-back [*Ceratostomella ulmi*] is stated to have risen within a year from 10 to 1,480; in this connexion a brief, popular note on the symptoms and mode of dissemination of the fungus is given, with an appeal for public co-operation in the prompt detection and diagnosis of infection [*R.A.M.*, xiii, p. 664].

Welch (D. S.), Herrick (G. W.), & Curtis (R. W.). **The Dutch Elm disease.**—*Cornell Coll. of Agric. Extens. Bull.* 290, 19 pp., 8 figs., 1934.

An account is given in semi-popular terms of the so-called Dutch elm disease (*Ceratostomella ulmi*) of the American elm (*Ulmus americana*), described as the most valuable shade and ornamental tree in the United States, besides being of considerable silvicultural importance. At the time of writing (June, 1934), one infected tree had been found in each of the States of Connecticut, Maryland, and Ohio, in addition to 1,200 previously reported from New Jersey and New York and eight eradicated in Ohio in 1930–1 [see preceding abstract]. The fact that a large proportion of the trees now known to be diseased contracted infection in 1933 illustrates the rapid spread of the fungus during the brief period since its establishment in the area having as its centre the port of New York. The success of the present eradication campaign is stated to be by no means assured, mainly owing to the prevalence of the insect carriers (*Scolytus multistriatus* and possibly other bark beetles) in the infected and adjacent areas; at the time of the Ohio outbreak these agents of dissemination were not known to be present. A list is given of possible substitutes for the elm,

which cannot, however, be readily replaced for the reasons indicated above.

RAO (M. G. V.) & IYENGAR (K. G.). **Studies in spike disease of Sandal. I. Two types of spike disease. II. The movement of the virus in Sandal plants.**—*Indian Forester*, lx, 7, pp. 481–491, 4 pl., 1934.

Two types of sandal (*Santalum album*) spike are differentiated on the basis of the authors' field observations in southern India [*R.A.M.*, xiii, p. 198], namely the common or rosette type and the so-called pendulous form which is prevalent in certain areas of the Tumkur, Hassan, and Mysore districts of Mysore State. The rosette symptom complex is characterized by short, stiff branchlets, clusters of shoots due to the development of dormant buds, minute, narrow, stiff leaves, entire absence of flowering in the affected shoots, and rapid death of root ends and haustoria. In the pendulous type of spike, on the other hand, the leaf-bearing twigs are long and drooping, there is no bunching of shoots and no sprouting of the dormant buds, the leaf blades are unusually large and broad (two or three times the area of those on rosetted shoots), sparse flowering occasionally takes place, and the haustoria and root ends die very slowly. The flowers, sometimes borne on apparently healthy branches of spiked trees, are already known often to show phyllody, but the authors found in addition a reduction in size of the flower buds and abnormal elongation of the pedicels to three or four times the normal length. The pistil is sometimes prolonged into a thick cylindrical body, bent on itself. No fruit is formed. These floral abnormalities are sometimes the first outward sign that the tree has become infected.

The pendulous type is as readily transmitted by grafting as the common type, 18 out of 30 tests being successful. The resulting infection was always of the pendulous type. In plants inoculated by means of twig-grafts with both the rosette and pendulous strains of spike, intermediate symptoms developed, including some excessive branching and rapid death of the root ends as in the former type, in comparison with which, however, the leaves are rather broader and the twigs longer, with a marked tendency to drooping. Such combined forms were commonly encountered naturally in localities where both types of spike are found.

It was ascertained by means of grafting experiments that the infective agent of spike is unable to traverse the xylem tissues, since a potted sandal plant inoculated with a spiked bud graft remained completely healthy above a 'ring' made on the stem by stripping off the cortex, whereas the lower part developed all the symptoms of the disease. Presumably, therefore, the passage of the virus is effected by way of the phloem and cortical parenchyma cells. Considerable variations were observed in the rate of spread of the agent of the disease in plants inoculated by budding, the budded part being subsequently isolated from that below either by ringing or by cutting it off. The most rapid movement was over 12 in. in 89 days after inoculation and the slowest under 11 in. in 172 days.

DOVER (C.) & APPANNA (M.). **Entomological investigations on the spike disease of Sandal (20). Studies on insect transmission.**—*Indian Forest Records* (Entom. Ser.), xx, 1, pp. 1–25, 3 pl., 1934.

The indirect evidence for the implication of an insect in the transmission of spike disease of sandal (*Santalum album*) [see preceding and next abstracts] is stated to be based on the results of experiments by members of the Indian Institute of Science and the Madras Forest Department, in which plants protected from the presumed vectors of infection by cloth cages remained healthy, while others exposed to the entry of insects contracted the disease. In a series of tests with aphids (a species of *Macrosiphum*) from *Lantana* [*camara*], the presence of which is consistently associated with a high incidence of spike [cf. ibid., xii, p. 129], symptoms bearing a close resemblance to the disease in question were induced in one plant.

The most important result of the present series of experiments [which are tabulated] is considered to be the transmission by *Moonia albimaculata*, a Jassid of common occurrence on *Lantana* and *Erythroxylon monogynum*, of a disorder indistinguishable from spike in five out of over 300 sandal plants exposed for 77, 169, 117, 112, and 59 days, respectively, to contact with the insects. The symptoms developed within two to three months. By 1st September, 1933 (8 to 15 months after the initiation of the tests on the different plants), two were dead and three spiked notwithstanding the provision of suitable hosts for the root haustoria of the sandal, and manuring, which would have promoted recovery from a purely physiological disturbance. The symptoms under observation, moreover, are quite distinct from the yellowing and dwarfing due to adverse conditions affecting the sandal tree or to heavy insect attack. Of some value as evidence of a connexion between *M. albimaculata* and spike transmission is the negative outcome of several tests with a number of dominant representatives of the sandal fauna. The five diseased plants were analysed for their nitrogen and starch contents [cf. ibid., xiii, p. 594], the results of the analyses further supporting the evidence that they were spiked, while additional evidence was the detection of intracellular inclusions in a cytological examination carried out by M. J. Narasimhan [ibid., xii, p. 479] on one of the affected plants.

DOVER (C.). **Insect transmission of spike disease.**—*Indian Forester*, lx, 7, pp. 505–506, 1934.

The writer has inspected the sandal [*Santalum album*] plants used by Sreenivasaya in his tests to establish by graft transmission of the disease whether the trees to which it was claimed that *Moonia albimaculata* had conveyed the virus were really infected with spike disease [*R.A.M.*, xiii, p. 550 and preceding abstracts]. He concludes that the negative outcome of the tests is due to the failure of organic fusion of the grafts between the infected and healthy plants. He is further unable to accept the statement regarding the complete recovery of the 'infected' plants.

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TUBEUF [C. v.]. **Blattfleckenkrankheit des Götterbaumes Ailanthus glandulosa Desfont.** [Leaf disease of the Tree of Heaven, *Ailanthus glandulosa* Desfont.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 6, pp. 309–316, 4 figs., 1934.

Attention is drawn to the occurrence, in the courtyards of Munich University, of a leaf disease of *Ailanthus glandulosa* which had previously been observed in Berlin and is also reported from Vienna.

A number of the pinnules of mature leaves develop small, irregularly shaped, dark green, glassy spots, scattered over the under surface, the epidermis of which appears to be raised. The affected parts assume a grey, granular aspect on the under side while the corresponding areas on the upper surface turn grey to brownish. Ultimately the diseased spots shrivel and drop out and the affected pinnules fall away from the midrib of the leaf, but there is no general extension of the disorder to the remaining pinnules, nor are the branches involved. No trace of bacteria or fungi could be detected in the diseased tissues, and the writer is inclined, pending further studies, to attribute the condition to a sudden increase of relative atmospheric and soil humidity, leading to a gorging of the most delicate tracheae of the leaves and injury to the adjacent parenchyma cells. This suggestion is supported by the occurrence of the disturbance in July and August, when a hot, dry spell is liable to be abruptly succeeded by overcast, chilly weather.

ANDRUS (C. F.). **Fungous flora accompanying decline of Boxwood.** —*Plant Disease Reporter*, xvii, 14, pp. 169–170, 1933. [Mimeographed. Received August, 1934.]

Notes are given on a number of fungi associated with the decline of boxwood (*Buxus sempervirens* and *B. suffruticosa*) in parks and estates in the District of Columbia. Severe twig and leaf infections were caused by *Volutella buxi* [renamed by von Höhnel *Chaetodochium buxi*: *R.A.M.*, xii, p. 634], the *Verticillium* stage of which (*V. buxi*) or *V. compactiusculum* is deeply systemic in many older plants. Immature perithecia of *Nectria rousseliana* [ibid., x, p. 34], believed to be the perfect stage of *Volutella buxi*, were found on *B. sempervirens* leaves early in August, 1933. Both species of box showed profuse infection by *N.* (?) *desmazierii*, frequently in conjunction with *Verticillium*. Other fungi of common occurrence included *Macrophoma candollei* [loc. cit.] on

both species, *Phoma conidiogena* [ibid., xii, p. 125] causing a silver-grey tip infection, *Phomopsis* (?) *stictica*, and *Phytophthora parasitica*, which is apparently a primary agent of decay in both species.

JØRSTAD (I.). **Om Heksekoster.** [On witches' brooms.]—'Festskr. til Olaf Hanssen', pp. 29–39, 4 figs., 1933. [Received August, 1934.]

Notes are given in popular terms on witches' brooms of trees and shrubs in Norway caused by *Taphrina* spp. [*R.A.M.*, vi, p. 762], various rusts, and unknown agencies [ibid., xiii, pp. 199, 283].

TIKKA (P. S.). **Über die Stockfäule der Nadelwälder Nord-Suomis (-Finnlands).** [On the butt rot of the conifer woods of North Finland.]—*Acta Forest. Fenn.*, xl, pp. 293–308, 2 pl., 3 figs., 1934.

The two principal agents of butt rot in the conifer woods of North Finland are stated to be *Fomes annosus* and *Polyporus borealis* [*R.A.M.*, xii, p. 739], the former producing a fibrous and the latter a brittle type of decay. Pine stands are less damaged than firs, only 6 to 12 per cent. of the trees in the former being attacked and the rot seldom extending above the butt, whereas firs have an incidence of 10 to 40 per cent. infection which attains a height of up to 1 m. Ecological conditions have been found to play an important part in determining the amount of butt rot in Finnish conifer stands, the health of which tends to be better on dry heathland than on swampy ground.

Fomitopsis annosa (Fr.) Karst. (= *Trametes radiciperda* Hart. = *Fomes annosus* Fr.) and *Bjerkandera borealis* (Fr.) Karst. (= *Polyporus borealis* (Wahl.) Fr.) are the names preferred by the author for the fungi under observation.

WOLLENWEBER (H. W.). **Fusarium bactridioides sp. nov., associated with Cronartium.**—*Science*, N.S., lxxix, 2060, p. 572, 1934.

A Latin diagnosis is given of *Fusarium bactridioides* n. sp., found in the Chiricahua Mountains, Arizona, parasitizing *Cronartium conigenum* [*R.A.M.*, ii, p. 3] on a *Pinus leiophylla* cone and subsequently shown by L. N. Goodding's inoculation tests in Oregon to be capable of attacking *C. ribicola* on *P. monticola*, and *C. harknessii* [ibid., ix, p. 147] and *C. filamentosa* on *P. contorta*.

The new species is characterized by continuous microconidia ranging from 5 to 11 by 3 to 5 μ, more rarely 1- to 2-septate, 7 to 21 by 3 to 6·5 μ; cylindrical or fusiform, straight or curved macroconidia, in sporodochia or pinkish-orange pionnotes, the stroma often showing a more or less intense purplish-black discoloration, 3- to 5-, occasionally up to 11-septate, measuring 17 to 47 by 4·5 to 7 (3-septate), 25 to 60 by 4·8 to 8 (5-septate), or 30 to 70 by 5 to 8 μ (7-septate); and sparse intercalary chlamydospores. The inoculation experiments amply demonstrated the efficacy of the fungus in rapidly destroying *C. ribicola* and the other rusts mentioned above.

ROBAK (H.). **Pholiota mutabilis (Schaeff.) Quél. som råtesopp på tremasse.** [*Pholiota mutabilis* (Schaeff.) Quél. as a rotting fungus on timber.]—*Friesia*, i, 2, pp. 91–94, 1 fig., 1933. [English summary. Received August, 1934.]

In February, 1933, fruit bodies of *Pholiota mutabilis* developed in malt agar cultures from a mycelium isolated from ground spruce pulp in Norway in the previous September. The fungus produces a vivid reddish-brown, sharply delimited rot, advancing at the rate of about 5 mm. daily in culture. It appears to be fairly widespread but not highly destructive.

ROBERTSON (W. A.). **Wood decay.**—*Journ. Soc. Chem. Ind.*, liii, 22, p. 493, 1934.

Rudge's theory of the primary importance of chemical agencies (as opposed to fungi and insects) in initiating the decomposition of structural timber [*R.A.M.*, xiii, p. 485] is considered by the Director of the Forest Products Research Laboratory, Princes Risborough, England, to be open to a number of objections [which are briefly summarized]. The experimental methods employed by Rudge are also criticized.

RUDGE (E. A.). **Wood decay.**—*Journ. Soc. Chem. Ind.*, liii, 23, pp. 511–512, 1934.

Replying to Robertson's criticisms of his theoretical and practical investigations on wood decay [see preceding abstract], the writer maintains that little or no advance in this problem, hitherto regarded as the exclusive province of the mycologist, botanist, and forester, has been made since the beginning of the eighteenth century. It is hoped that the studies under discussion, representing the first systematic attack from a purely chemical standpoint, may remove some of the existing difficulties.

HARKOM (J. F.). **Open-tank treatment of Red Pine lumber.**—*Dept. of the Interior, Canada, Forest Service Circ.* 40, 16 pp., 2 pl., 1934.

Full directions are given for the preservative treatment of red pine [*Pinus resinosa*] timber in Canada by the hot or cold open-tank process with creosote oil or zinc chloride [*R.A.M.*, xiii, pp. 138, 202, *et passim*], together with the tabulated results of experiments showing the application of the method in particular cases. The standard specifications of the American Wood Preservers' Association for both preservatives are appended.

CROSBY (C. R.) & CHUPP (C.). **The control of diseases and insects affecting vegetable crops on Long Island.**—*Cornell Agric. Exper. Stat. Extens. Bull.* 278, 87 pp., 9 figs., 1934.

This bulletin is stated to be an attempt to bring together the more pertinent information concerning the practical control of fungal, bacterial, and virus diseases, insect pests, and physiological disorders of the principal vegetable crops on Long Island, brief popular descriptions of which are also given. Besides material which was published in previous communications [most of which,

relating to the parasitic diseases, has been noticed from time to time in this *Review*], the paper also contains additional information from unpublished data of the research workers of the State experimental stations.

WILSON (J. D.). **Cabbage club-root in muck soils.**—*Ohio Agric. Exper. Stat. Bimonthly Bull.*, xix, pp. 58–65, 1934. [Abs. in Supplement to *Journ. Soc. Chem. Ind.*, liii, 34, p. 729, 1934.]

Club root of cabbage [*Plasmodiophora brassicae*] has not been found severe in Ohio soils having a hydrogen-ion concentration of P_H 7·3 to 7·4, and liming to attain this reaction, preferably with calcium hydroxide, is normally an adequate precautionary measure, especially in the greenhouse [*R.A.M.*, xii, p. 355]. Mercury preparations were the only fungicides with an appreciable degree of efficacy against this disease.

JØRGENSEN (C. A.). **Nogle Undersøgelser over Plantesygdomme med Frøsmitte.** [Some investigations on plant diseases from seed infection.]—*Tidsskr. for Planteavl*, xl, 1, pp. 119–147, 12 figs., 1934.

Investigations on seed infection in the following important vegetable diseases in Denmark are described. Nearly all the 89 celery seed samples examined in 1926–7 for the presence of *Septoria apii* [*R.A.M.*, xiii, p. 614] were infected to the extent of between 1 and 67 per cent., Non Plus Ultra being the most and Amager Market the least so. Control may be effected by spraying with copper-containing mixtures to prevent invasion by the fungus during the ripening of the seed, and seed-treatment with a standard disinfectant, of which germisan and uspulun-universal (six hours' immersion) may be specially recommended. Two applications of 2 per cent. Bordeaux mixture gave particularly good results in bad years, the average weight of the produce of the sprayed plants of Amager Market in 1927 being 824 gm. compared with 505 gm. for the untreated control.

Phoma apiicola, the agent of celery scab [ibid., xiii, p. 73], has been isolated on a few occasions from diseased roots. *P. rostrupii* [ibid., vii, p. 701] was isolated from a sample of carrot seed and inoculated into roots and stems with positive results, producing on the former a sunken, brownish-black rot, and on the latter water-soaked, brownish-green spots or stripes up to several cm. in length. During the summer infection spread extensively by means of the conidia, with the result that the umbels wilted, turned brown, and shrivelled before the seed reached maturity; the average incidence of infection in five samples each of 100 seeds was 16 per cent. Some years ago the decay caused by *P. rostrupii* was responsible for such heavy losses in Denmark that in certain localities the growing of carrots for seed had to be entirely abandoned. A considerable improvement, however, has been effected by replacing the practice of raising the plants for seed from transplanted roots by that of planting out the latter directly in the field and allowing them to overwinter there.

Alternaria radicina [ibid., xiii, p. 354] was isolated from a sample of carrot seed in 1927 and on inoculation into carrot roots produced

a deep, black rot of the wet type. Seedlings from infected seed may be killed by the fungus, which on the leaves and petioles of older plants forms dry spots or stripes; from the base of the petiole the mycelium spreads to the upper part of the root.

The examination of a sample of English peas on the germinator revealed 18 per cent. infection by *Ascochyta pisi* [ibid., xiii, p. 611]; the germination percentage of this material was 75, and 11 per cent. of the resulting seedlings showed the presence of the organism on the leaves or stems. Seed disinfection with uspulun-universal proved only moderately effective.

A greenhouse test in 1926 showed that bean seeds heavily spotted over the surface from infection with anthracnose (*Colletotrichum lindemuthianum*) may actually germinate better than those bearing only an inconspicuous lesion close to the hilum. In addition to seed selection, disinfection with uspulun-universal (3 to 6 hours' immersion in a 0·5 per cent. solution) was found to give a measure of control of anthracnose, which cannot, however, be entirely eliminated by either method. The results of spraying tests have been generally unsatisfactory, and the prospects of breeding for immunity from the disease do not seem very hopeful. The well-known susceptibility of the Wax groups of *Phaseolus vulgaris* was exemplified in a varietal trial at Lyngby in 1916.

IKATA (S.). **Studies on red spot disease (chocolate spot disease) of Vicia faba.**—*Rept. Agric. Exper. Stat. Okayamaken, Extra No.* 38, 28 pp., 5 pl., 5 figs., 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vii, 1–2, p. (6), 1934.]

The reddish-brown, circular spotting of the leaves and streaking of the stems of broad bean (*Vicia faba*), usually attributed to a pathogenic bacterium [*Bacillus lathyri*: *R.A.M.*, xiii, p. 492], has been found by the writer's investigations in Japan to be due to *Botrytis fabae* n. sp., a species allied to *B. cinerea* [but see *B. fabae* Sardiña: ibid., ix, p. 424; xi, p. 346]. It is thought probable that the new fungus may be also in part responsible for the streak or chocolate spot disease in England. *B. fabae* exerts a very virulent pathogenic action on *V. faba*, being apparently restricted to this host among the Leguminosae. Sclerotia are formed on the stems and petioles during the summer and conidia produced continuously from November to March. The fungus enters the host through the epidermal cells, not by way of the stomata.

SMITH (K. M.). **The mosaic disease of Sugar-Beet and related plants.**—*Journ. Min. Agric.*, xli, 3, pp. 269–274, 4 figs., 1934.

In this paper the author gives an account, based partly upon the researches of other workers, but mainly upon his own work carried out at Cambridge, of mosaic disease of sugar beet and its manner of spread. There is no evidence that more than one virus is concerned, the slightly different symptom-expressions exhibited being probably all due to one agent. The virus is transmissible to all varieties of beet and also to spinach. In Russia *Chenopodium album* and *Amaranthus retroflexus* are affected [*R.A.M.*, xi, p. 90]. In the British Isles *C. album* (to which the author experimentally

transmitted the virus) is a very common weed and is frequently infested by the insect vector of beet mosaic, *Aphis rumicis*. The virus was experimentally transmitted by means of this vector as well as by *Myzus persicae*, and was readily transmitted to healthy beet seedlings and *C. album* by the ordinary laboratory method of rubbing the leaves with a pestle dipped in the sap of an affected plant.

VERPLANCKE (G.). **Etude comparative de glomérules de Betteraves.** [A comparative study of Beetroot seed-clusters.]—*La Sucrerie Belge*, liii, 19, pp. 361–377 ; 20, pp. 385–392, 1 fig., 8 graphs, 1934.

According to Miss Doyer, beetroot seed-clusters are generally heavily infected by *Phoma betae* in Holland [*R.A.M.*, ix, p. 665 ; see also xiii, p. 417], but in a recent examination of 20 commercial Belgian varieties, six showed no external trace of infection until after 15 days in the germinator. The pycnidia of the fungus were subsequently detected in the alveoli containing the seeds, which are not accessible to a disinfectant. It is concluded, therefore, that the presence of pycnidia on the exterior of the clusters is not a reliable criterion of infection. Conflicting results were also obtained in experiments with various fungicides, of which germisan may be mentioned as definitely invigorating the plants and generally reducing the incidence of infection, though in the case of one variety sulphuric acid proved greatly superior. It is considered urgently necessary to secure a higher degree of uniformity in the methods used for the examination of beetroot clusters from a germinative standpoint. *P. betae* was found to be responsible for most, if not all, of the gaps in the seedling stands.

SCHMIDT (E. W.). **Ueber den Wurzelbrand der Rüben. Eine kritische Betrachtung.** [On the root rot of Beets. A critical symposium.]—*Deutsche Zuckerind.*, lix, 26, pp. 520–521, 1934.

Discussing current theories concerning the etiology of beetroot rot, the writer points out that *Phoma betae* [see preceding abstract] is regularly present on ordinary commercial seed to the extent of 40 to 100 per cent., its prevalence being in general directly proportionate to the humidity of the climate of origin. *Pythium de Baryanum* and *Aphanomyces levis*, on the other hand, are strictly confined to the soil. In recent tests at the Kleinwanzleben sugar factory experiment station, no difference was observed between heavily inoculated and uninoculated seed as regards the incidence of disease in the resultant seedlings, showing that the latter must develop a certain measure of receptivity before infection can take place. It was further ascertained by experiments that *P. betae* cannot subsist in the soil either on twine impregnated with beet juice or on ground seed-clusters, whereas it remained viable for ten months on thick stems. The removal of the latter from the field is therefore of the utmost importance in combating the disease. In the circumstances seed disinfection can only afford partial control, which is considered, however, to be well worth while as its approximate cost is only M. 1 per acre.

MEYER-HERMANN (K.). **Erfolgreiche Bekämpfung der Herz- und Trockenfäule der Rübe durch Borax.** [The successful control of heart and dry rot of the Beet by borax.]—*Pflanzenbau*, xi, 1, pp. 24–28, 1934.

Excellent results have been obtained in large-scale experiments at the Harleshausen (Germany) Plant Protection Station in the control of heart and dry rot of beets by the application of coarse borax salt to the soil at the rate of 10 to 20 kg. per hect. [*R.A.M.*, xiii, p. 610]. This substance, which only costs M. 0·27 to 0·33 per kg., increased the sugar content of a treated beet plot from 19·6 to 21·2 per cent. when applied at the rate of 10 kg. per hect., the dry weight being simultaneously raised from 26·94 to 29·24 per cent. With heavier doses of borax (up to 40 kg. per hect.) there was a gradual decline both in sugar content and dry weight. In its present commercial form borax is readily miscible with 40 per cent. potash salt which facilitates its application to the soil. It is recommended that the appropriate quantity of borax (not below 10 or over 20 kg.) be thoroughly mixed with 1 doppelzenter potash remaining from the basic fertilizer and the whole strewn over the soil immediately before or after drilling.

FOËX (E.). **Maladie du coeur de la Betterave.** [Beetroot heart rot.]—*Journ. d'Agric. Prat.*, N.S., xcviii, 26, pp. 518–520, 1934.

The conclusions of Gäumann [*R.A.M.*, ix, p. 757], Brandenburg [ibid., xii, p. 2], Bobko and Belvoussov [ibid., xiii, p. 72], and Marchal [ibid., ix, p. 152] with regard to the etiology and control of heart rot of beet (associated in part with *Phoma betae* and also with boron deficiency) [see preceding and next abstracts] are summarized.

NOWOTNÓWNA (ANNA). **The influence of boron upon the growth of Sugar Beets.**—*Gaz. Cukrownicza*, lxxiv, pp. 104–108, 1934. [Abs. in *Chem. Abstracts*, xxviii, 16, p. 5100, 1934.]

Sugar beets [in Poland] grown under conditions of boron deficiency [see preceding abstracts] were found to succumb readily to dry rot of the leaves. The optimum quantity of boron for growth and sugar content was determined as 0·1 gm. per pot, normal development being observed with 0·025 to 0·40 gm. borax per 36 kg. sand. Larger amounts cause abnormal chlorophyll formation and starch accumulation in the foliage, but in time the plants adapt themselves even to quantities up to 1·6 gm. per pot with little resultant deficiency in sugar content and weight.

LIRO (I.). **Finland: the Onion smut.**—*Internat. Bull. of Plant. Protect.*, viii, 7, pp. 150–151, 1934.

In Persoon's herbarium at Leyden, Holland, the writer detected a specimen of *Tuburcinia* [*Urocystis*] *cepulae* [*R.A.M.*, xiii, pp. 288, 614] on onion, the label being inscribed by Persoon (probably, from the writing, at an advanced age, *c.* 1834) as ? *Uredo cepae*. Persoon having died while practising medicine in Paris, the fungus may reasonably be supposed to have originated in that city or its environs. This discovery is considered to prove that *U. cepulae*,

hitherto regarded as a North American species, actually comes from Europe, whence it was long ago introduced into the New World, possibly by French emigrants.

JØRSTAD (I.). **Melding om plantesykdommer i land- og hagebruket. VIII. Sykdommer på Tomater og Agurkvekster.** [Report on plant diseases in agriculture and horticulture. VIII. Tomato and Cucumber diseases.]—Reprinted from *Landbruksdirektørens Årsmelding, Tillegg* C, 55 pp., 1934.

Notes are given on the symptoms, etiology, and control of a number of well-known fungous, virus, and physiological diseases of tomatoes and Cucurbitaceae in Norway observed during the period from 1928–33 [cf. *R.A.M.*, vii, pp. 700–1].

NICOLAS (G.) & AGGÉRY (Mlle). **Observations sur un parasite de Citrullus vulgaris Schrader.** [Notes on a parasite of *Citrullus vulgaris* Schrader.]—*Bull. Soc. Myc. de France*, l, 1, pp. 115–119, 2 figs., 1934.

This is a slightly expanded version of the authors' note on the taxonomy of *Gloeosporium lagenarium* on watermelon in France, which has already been noticed from another source [*R.A.M.*, xii, p. 417].

BENLLOCH (M.) & DOMINGUEZ (F.). **La enfermedad de los Pimentales en Aldeanueva del Camino.** [The disease of Chillies in Aldeanueva del Camino.]—*Bol. Pat. Veg. y Ent. Agric.*, vii, 27–30, pp. 1–20, 10 figs., 1934.

This is a progress report of the investigation, started in 1931, of the deterioration of chilli pepper [*Capsicum annuum*] mentioned in a previous communication [*R.A.M.*, xii, p. 354], which is stated to have become increasingly threatening to the cultivation of the crop in the province of Caceres, Spain, where peppers are said to be one of the chief dietary items of the local peasantry. The deterioration was shown to include three different diseases, the first of which, locally known as 'seca' [withering], was found to be caused by an unidentified species of *Fusarium* of the *Martiella* section. It is characterized by the sudden wilting of adult plants, rapidly causing death, which always occurs during the hottest period of the season, chiefly after a heavy rain. There were indications that it is most severe in soils tending towards acidity, for which reason sufficient liming to render them alkaline is recommended as a possible measure of control, coupled with adequate crop rotation. In contaminated soils it is believed that the occurrence of the trouble may be prevented by spraying the plants around the collars with a mixture composed of 75 gm. copper carbonate, 750 c.c. ammonia, and 100 l. water.

The other two conditions, respectively known locally as 'niebla vieja' [old blight] and 'niebla nueva' [new blight], appear to be caused by filterable virus agencies [cf. ibid., xi, pp. 226, 431], especially the second which presents features characteristic of diseases of the mosaic group, and is apparently transmitted in the field by aphids. It is the more important of the two, and may manifest itself at any stage in the development of the plants,

which are markedly stunted and retarded in their growth, and remain sterile or produce deformed and dwarfed fruit. The 'niebla vieja', on the other hand, is chiefly characterized by the defoliation of the apical portions of the shoots, while the leaves lower down show no lesions apart from a certain loss of turgidity. In some cases, however, the stems and fruit stalks may be covered with more or less abundant greyish spots, occasionally with whitish centres. The root system of affected plants is always normal. Attempts to transmit tobacco mosaic to chilli plants from tobacco fields in the neighbourhood gave negative results. Observations indicated that the 'niebla nueva' caused less damage on heavy soils with a high content in iron and magnesium, and experiments are in hand to establish whether the disease may be minimized by the addition of these elements to the soil.

SARDIÑA (J. R.) & LANDALUCE (P. U.). **La podredumbre de la raíz de la Viña.** [Root rot of the Vine.]—*Bol. Pat. Veg. y Ent. Agric.*, vii, 27–30, pp. 208–216, 5 figs., 1934.

An official investigation in December, 1931, of a serious root rot of the vine prevalent in the Lugo province of Galicia, Spain, showed that it was caused by *Armillaria mellea* [*R.A.M.*, ix, p. 360], which is stated also to inflict serious injury on fruit trees both in Galicia and in all the humid and semi-humid regions of Spain. A brief description is given of the rot of the vine roots, the distinguishing features of which are compared in a table with those caused by *Rosellinia necatrix* [loc. cit.], and a popular account is appended of the morphology of *A. mellea*.

Control of the rot can only be effected by preventive measures, such as the extirpation and destruction by fire of all infected material in the vineyard, deep cultivation of the soil, drainage of the holes in which the vines are planted with stones placed at the bottom, instead of wood blocks, as is the usual custom in Galicia, the use of absolutely healthy planting stock, and the avoidance of insufficiently matured stable manure, which should be preferably replaced by well-balanced mineral fertilizers.

JACQUEMAIN (R.) & GRAVIER. **Note sur deux spécialités anti-cryptogamiques.** [A note on two proprietary brands of fungicides.]—*Comptes rendus Congrès Soc. Savantes Paris et Départements 1932, Section des Sciences*, pp. 293–294, 1932. [Received June, 1934.]

Complete control of vine mildew [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*] was obtained at Besançon by the simultaneous application on 13th June and 7th and 31st July, 1931, of bouisol and sulsol, of which the former is designed to replace Bordeaux mixture and the latter sulphur [*R.A.M.*, xi, p. 587; xii, p. 199; xiii, p. 121]. The composition of bouisol is given as 22 per cent. copper oxychloride, 50 per cent. water, and 28 per cent. of an organic complex; and that of sulsol as 40 per cent. very finely triturated sulphur in suspension, 44 per cent. water, and 16 per cent. of the above-mentioned organic complex. Both diseases attacked the vines of a neighbouring plot treated with Bordeaux mixture and sulphur.

RAVAZ (L.). **Un nouveau parasite de la Vigne en Algérie.** [A new parasite of the Vine in Algeria.]—*Prog. Agric. et Vitic.*, ci, 18, p. 430, 1934.

This is a brief report of what is believed to be the first record in the neighbourhood of Algiers in the spring of 1934 of a decay of young vine shoots, associated with a wilt and the presence on them of an unidentified external, white mycelium, interspersed with sclerotia 2 to 5 mm. in diameter, hyaline on the surface but faintly yellowish internally. The trouble was chiefly observed attacking the lower shoots of stocks on soil that had been flooded for some days [see next abstract].

A. (P.). **Pourriture blanche des rameaux de Vigne.** [White rot of Vine shoots.]—*Prog. Agric. et Vitic.*, ci, 20, pp. 471–472, 1934.

The author states that the decay of young vine shoots recently reported from the neighbourhood of Algiers [see preceding abstract] has been known to occur in many localities of the department of Algiers for some considerable time, and in 1923 it caused localized damage in the region. The trouble is caused by *Sclerotinia libertiana* [*S. sclerotiorum*] which, under conditions of high humidity, rapidly penetrates and rots the tissues of young vine shoots, especially towards their apex; occasionally, however, infection starts at the base of the shoots, which then easily break off. The disease only occurs during more or less prolonged spells of wet weather, and its progress is rapidly checked on the return of dry weather. In 1934 many affected shoots were found on stocks that had received two sprayings with Bordeaux mixture against mildew [*Plasmopara viticola*], a fact which is considered to indicate that the disease is not amenable to control by Bordeaux mixtures of the strengths usually employed.

WALLACE (G. B.). **Report of the Mycologist, 1933.**—*Ann. Rept. Dept. of Agric. Tanganyika Territory, 1933*, pp. 76–78, 1934.

During the period under review cashew nut (*Anacardium occidentale*) seedlings in Tanganyika developed angular leaf spots and stem lesions resembling those produced on mangoes by *Bacillus mangiferae* [*R.A.M.*, xi, p. 793]. Long smut of sorghum [*Tolyposporium ehrenbergii*: ibid., xiii, p. 300] was widely distributed but not frequent in the Shinyana district, and was found also at Mkuyuni. In the former locality the commonest sorghum smut was grain smut [*Sphacelotheca sorghi*: ibid., xii, p. 552], the native mixed varieties showing 8 to 43 (average 25) per cent. infection. A very common parasite of young sorghum in Tanganyika is *Ascochyta sorghina*, which produces long, grey, dead areas on the leaves; older plants do not become infected and do not suffer from the attack sustained while young. *Diplodia macrospora* caused a leaf spot of maize [ibid., xii, pp. 201, 552]. From an orange showing a large, dry, leathery, dark brown area with a minute puncture at the centre the following fungi (identified at the Imperial Mycological Institute) were isolated: *Phytophthora palmivora*, *Colletotrichum gloeosporioides*, and a species of *Polyopeus*, a

genus not before recorded on citrus. All early plantings of cowpeas and other leguminous crops at Mwanza were badly attacked by virus disease in April and May, though the February plantings remained unaffected. The resistance to rosette disease shown by Basse and Philippine White groundnuts in West Africa [ibid., xi, p. 697; xii, pp. 5, 143] was not maintained in Tanganyika. Leaf curl of sesame [ibid., xii, p. 552] was less severe at Morogoro than in 1932, and was present also on Mafia Island. The affected leaves bore enations similar to those seen in tobacco leaf curl [ibid., xii, p. 475], which may indicate that the diseases are related.

Botany.—*Forty-sixth Ann. Rept. Georgia Exper. Stat. for the year 1933–34*, pp. 26–29, 1934.

It was found, in confirmation of previous tests, that the agent of peach rosette [*R.A.M.*, xiii, p. 384] behaves like a low-temperature organism.

Work has been in progress since 1931 on the development of a groundnut variety combining the desirable characters of the Spanish with resistance to *Cercospora* leaf spots [*C. arachidicola* and *C. personata*: ibid., xiii, p. 74] and *Sclerotium rolfsii*. Eighty varieties and strains are being grown at two stations with this object in view, and the selections at present available include upwards of 200 prolific plants of apparently satisfactory reaction to both diseases.

Two years' observations on the precautions necessary to ensure the production of high-grade tomato plants in south Georgia indicated that seed disinfection is fully as important as spraying for this end, and prominence is now being given to the former mode of treatment.

Adam (D. B.) & Pugsley (A. T.). **Bacterial plant diseases in Victoria.**—*Journ. Dept. Agric., Victoria*, xxxii, 6, pp. 304–311, 323, 8 figs., 1934.

In 1933, stocks (*Matthiola incana*), especially of the Queen Alexandra variety, were attacked in Victoria by a disease which rendered the flowers commercially useless. Dark greyish-green, water-soaked lesions appeared on the stems and flower stalks and later turned brown, the cortex tending to split. Leaf spotting accompanied by yellowing of the leaf tips was occasionally present, but many affected plants showed stem lesions and leaf yellowing only. The causal organism (which appears to differ in certain respects from those described on the same host as *Phytomonas* [*Pseudomonas*] *campestris* and *P.* [*Bacterium*] *matthiolae* [*R.A.M.*, xiii, p. 306]) was a Gram-negative, motile rod, approximately 1·7 to 3·4 by 0·7 μ, which on beef extract agar produced smooth, white, glistening colonies in 48 hours at 27° C., had a positive diastatic action on starch agar, grew abundantly in Fermi's solution, liquefied gelatine, caused litmus milk to become alkaline at the top and decolorized at the bottom, produced acid but no gas from glucose and saccharose but not from lactose in peptone-free media, and did not produce indol or reduce nitrates. Its pathogenicity was established by needle inoculations near the top

of the stem, which caused the development of water-soaked areas in 5 to 7 days.

Oleanders (*Nerium oleander*) near Melbourne showed cream-coloured, later brown to black, spots often surrounded by a yellow halo on the leaves, on the upper (and occasionally on the lower) surface of which they usually developed into small warts. Infection of the midrib was common, starting as a water-soaked, elongated area developing into a brown or black canker. The overgrowth of the midrib at the points of infection caused the leaf to bend over sharply towards the stem. When infected on emergence the young leaves were malformed and distorted. Young infected stems showed dark, elongated, slightly swollen areas, while later the epidermis split, the lesions persisting as cankers on the old wood, similar cankers developing on the peduncles. Infected young pods remained short, thick, malformed, and partly covered with necrotic black patches. On older pods small warts developed. The causal organism was a motile, Gram-negative rod approximately 1·2 to 2 by 0·4 μ which formed small, moist, smooth, circular, white colonies and was determined as *Phytomonas tonellianum* (Ferraris) n. comb. [*Bact. tonellianum* Ferraris: Trattato di Patologia, &c., i, p. 104; syn. *Pseudomonas savastanoi* var. *nerii*: *R.A.M.*, v, p. 173; xi, p. 698.]

Notes are also given on mulberry blight (*Bact. mori*) [ibid., xii, p. 271], French bean (*Phaseolus vulgaris*) wilt (*Bact. flaccumfaciens*) [ibid., xii, p. 71], walnut blight (*Bact. juglandis*) [ibid., xii, pp. 338, 339], crown gall of stone fruit trees (*Phytomonas* [*Bact.*] *tumefaciens*) [ibid., xii, p. 516], and lemon black pit (*P.* [*Pseudomonas*] *syringae*) [ibid., viii, p. 423; xii, p. 376].

BURNET (F. M.). **The bacteriophages.**—*Biol. Reviews*, ix, 3, pp. 332–350, 1 graph, 1934.

After summarizing the present position of the bacteriophage problem as shown in contemporary literature [*R.A.M.*, xiii, p. 589], the writer reaches the following main conclusions. Bacteriophages may be regarded as a class of diverse micro-organisms with a common ability to parasitize or live in symbiosis with bacteria. They show about the same range of size and many of the functional characteristics of the viruses associated parasitically or symbiotically with animals and higher plants, especially the incapacity to multiply in the absence of living cells. The bacteriophages present all the typical attributes of biological evolution, including wide diversity of size, functional activity, and chemical (antigenic) structure, accompanied by a clear tendency to segregation into distinct species within which only minor variations occur. Specific differentiation among the bacteriophages appears to be about as distinct as in bacteria, while as regards 'pathogenicity' there are many analogies between the two groups of organisms. Thus, in both it is found that some are restricted to a single host while others are able to attack a wide range of species, and just as bacterial strains vary in virulence, some phages are highly destructive to the susceptible bacterium whereas others show all grades of diminishing intensity of lysis until the permanent phage-bacterium symbiosis characteristic of certain bacteria is reached.

KOUDELKA. **Neue Probleme in der Brandpilzfrage.** [New problems in the smut question.]—*Nachricht. über Schädlingsbekämpf.*, ix, 2, pp. 100–104, 2 figs., 1934.

In this paper, reprinted from *Blätter für Pflanzenbau u. Pflanzenzücht*, Tetschen a.d. Elbe, xi, pp. 27–31, 1934, inoculation experiments with *Ustilago tragopogonis* from *Tragopogon* on cereal seed-grain at Tetschen a.d. Elbe [Czecho-Slovakia] are described, which resulted in a reduction of germination, especially in barley. Seedlings from the inoculated seed-grain were considerably retarded in growth. Similar effects followed infection by *U. scorzonerae* from *Scorzonera humilis* [*R.A.M.*, xii, p. 88]. A reddish discoloration frequently characterized the diseased plants, which further reacted to the attacks of the smuts by profuse tillering; in rye the tillers averaged more than three times as many as in the uninoculated controls but were often much stunted and arrested in development. 'White ear' of oats [cf. ibid., x, p. 490] also appears to result from latent infection by these species. In the author's cultures of these two smuts, smut spores (chlamydospores) were formed, this being apparently the first report of their occurrence in culture. The fungi would thus be capable of completing their entire life-cycle, up to and including smut spore formation, in a saprophytic state in the soil without the aid of a living host.

ENOMOTO (S.). **On the rest period and its shortening in smut spores (preliminary report.)**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 167–172, 1934.

The writer's experiments [the results of which are tabulated and briefly discussed] showed that the fresh spores of *Ustilago tritici*, *U. avenae*, *U. nuda*, *U. grandis* [*R.A.M.*, iv, p. 499], *U. zeae*, and *U. hordei* germinate less readily than those kept at room temperature for several days, indicating that a period of after-ripening is beneficial for the process. A highly stimulatory action on the germination of the above-mentioned smuts (except *U. hordei*, which was not included in the test) and *Sorosporium* [*U.*] *panicimiliacei* [ibid., xi, p. 566; xii, p. 616] was exerted by ether (20 hours' exposure to 0·3 to 0·5 c.c. per l. of space in a sealed glass jar) [ibid., iii, p. 742].

HEWLETT (C. H.) & HEWLETT (J. H.). **Hot-water treatment of seed of Barley and Wheat.**—*New Zealand Journ. of Agric.*, xlix, 1, pp. 37–41, 1934.

Tables are given showing the quality and quantity of the crops obtained during the period 1930–4, inclusive, in the Canterbury district of New Zealand, from untreated barley seed and seed subjected to the hot water treatment against smut [*Ustilago hordei* and *U. nuda*: *R.A.M.*, xiii, p. 24]. The loss sustained through growers sowing their own seed was again apparent in 1934, though the number doing so has appreciably diminished.

In 1934, when the hot water treatment of barley seed was introduced into the locality, wheat seed similarly treated against smut [*U. tritici*: ibid., iv, p. 533; v, p. 84] was sown on the Canterbury Seed Company's farms. Since then an increasing amount of wheat seed has been treated annually and the product distributed among

growers. In 1931 wheat seed certification [ibid., vii, p. 571] was limited to crops grown from hot water treated pure strains. In the last few years the incidence of *U. tritici* has greatly diminished locally and the disease is now a comparatively minor source of anxiety [cf. ibid., vi, p. 678; vii, p. 224]; the wheat yield has also steadily increased.

ZALESSKY (V. K.) & WASJUTA (O. N.). **On the means of fighting with Ustilago tritici.**—*Microbiol.*, Moscow-Leningrad, ii, 2, pp. 155–161, 1933. (Russian.) [Abs. in *Bot. Centralbl.*, N.F., xxv, 1–2, pp. 55–56, 1934.]

In an attempt to diagnose the presence of loose smut of wheat (*Ustilago tritici*) by the physiological characters of the seed-grain, dullness (loss of gloss) was found to be of uncertain value as a criterion. A definite correlation was observed, however, between dullness and decline of specific gravity and when the seed-grain was floated in chloroform, and alcohol added until it separated into two layers, the upper consisted of the infected grains. The method also proved applicable to barley infected by loose smut [*U. nuda*], the mycelium of which could be detected by microscopic examination in all the floating seeds.

Further experiments showed a higher enzymatic activity in the diseased than in healthy wheat seed-grain, the respiratory energy of the former in the early stages of germination exceeding that of the latter by 1·2 to 1·5 per cent.

GASSNER (G.) & KIRCHHOFF (H.). **Versuche zur Bekämpfung des Weizenflugbrandes mittels Benetzungsbeize. II. Mitteilung.** [Experiments in the control of loose smut of Wheat by moistening. Note II.]—*Phytopath. Zeitschr.*, vii, 3, pp. 271–284, 1 graph, 1934.

Whereas in previous experiments in the control of loose smut of wheat [*Ustilago tritici*] by moistening in closed vessels [*R.A.M.*, xiii, p. 293], the moistened seed-grain (Santa Fé) was immediately exposed to the high steeping temperature of 50° C., in the present series (1933–4) the sterilization was preceded by pre-soaking at room temperature for varying periods up to four hours. At the same time the steeping temperature was adjusted to a range of 50° to 56°, the amount of water used varied from 4 to 6 l., and the disinfection period from ¼ to 4 hours; isopropyl alcohol (2 per cent.) or methylated spirit (3 per cent.) was added to the water.

The results of the earlier series of tests were fully substantiated as regards the effects of the temperature and quantity of the steeping water and the increase in efficiency resulting from the addition of alcohol. The pre-soaking also increased the efficiency of the process, and by this coupled with the use of alcohol it was found possible to reduce the entire period of treatment to between three and four hours; of this time, not less than one hour should be spent on the actual hot water disinfection. Within these limits, the longer the pre-soaking, the less will be the injury to germination and the more efficacious the subsequent disinfection against loose smut.

In supplementary trials with the General von Stocken and

Salzmünder Standard winter wheat varieties an explanation was sought for the fact that short periods of pre-soaking render the seed-grain more sensitive to high temperature than long ones (up to 24 hours in the case of the former and up to 16 in that of the latter variety). It was found that injury to germination varies directly with the water content of the embryo, which falls with an increase in the pre-soaking period owing to the transference of the absorbed moisture from the embryo to the endosperm.

NEILL (J. C.). **Seed treatments for Wheat, Barley and Oats.**—*New Zealand Journ. of Agric.*, xlix, 1, pp. 43–45, 1934.

After discussing the advantages and disadvantages of various commonly used seed disinfectant treatments against the smuts [*Ustilago* and *Tilletia* spp.] of wheat, barley, and oats (other than those controllable only by hot water), the author gives notes on the following treatments, arranged in descending order of preference: organic mercury dusts, copper carbonate and copper oxychloride dusts [*R.A.M.*, xi, p. 566], formalin steep and sprinkle, and copper sulphate steep and sprinkle. The cost of the materials and the method of application are indicated in each case.

NIEVES (R.), BARRAZA (J. A.), & HOROVITZ (N.). **Estudios sobre la distribución y prevalencia relativa de la Tilletia tritici y Tilletia levis, en el sudeste de La Pampa, en 1932.** [Studies on the distribution and relative prevalence of *Tilletia tritici* and *Tilletia levis* in the south-east of La Pampa in 1932.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxv, 1–3, pp. 79–101, 1933. [Received October, 1934.]

A fully tabulated account is given of the writers' studies on the distribution and relative prevalence of *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] on wheat in the south-east of La Pampa, Argentine Republic, during the agricultural season of 1932–3 [*R.A.M.*, xii, p. 682]. Of the 500 samples examined, 330 (66 per cent.) showed bunt infection, due in 229 cases to *T. caries*, in 83 to *T. foetens*, and in 18 to both species, corresponding to a relative frequency of 71 per cent. for the former. Of the 66 per cent. diseased samples, 36·4 per cent. showed merely traces of bunt, 10·4 per cent. an 'average' incidence, and 1 per cent. a fair number of infected grains; in these the grain was sold without any deduction for smut prevalence. In the remaining 18·2 per cent. the heavily smutted product was subjected to a discount varying from 50 centavos to 2 pesos [1 peso = 3s. 11½d. at par] per quintal [1·9684 cwt.].

WISMER (C. A.). **Inheritance of resistance to bunt and leaf rust in the Wheat cross, Oro x Tenmarq.**—*Phytopath.*, xxiv, 7, pp. 762–779, 3 graphs, 1934.

The results [which are fully described and tabulated] of a study at the Kansas Agricultural Experiment Station on the inheritance of resistance to bunt (*Tilletia levis*) [*T. foetens*: *R.A.M.*, xiii, p. 85] in the F_2, F_3, and F_4 generations of the wheat cross, Oro (resistant) × Tenmarq (susceptible), indicate that a high degree of susceptibility

to the disease is recessive. Some of the F_4 lines showed greater resistance to bunt than Oro, denoting that Tenmarq (a cross between a hard red winter Crimean wheat, similar to Kanred, and Marquis) may also carry one or more factors for resistance to the disease. Multiple factors are thought to be probably responsible for the inheritance of resistance to bunt in this cross. When inoculated with a composite of Kansas bunt forms, Oro develops an average of 5 per cent. infection and Tenmarq 57 per cent. The correlation coefficient of $r = 0{\cdot}8875 \pm 0{\cdot}0106$ between the reaction of the hybrid selections to physiologic form 1 and that of the same selections to a composite of Kansas bunt collections is very high.

Transgressive segregation was observed in a study of leaf [brown] rust (*Puccinia triticina*) [ibid., xiii, p. 567] reaction in the progeny of this cross, indicating that both parents probably contain factors for resistance to the rust. No correlation was detected between bunt and brown rust infection. A bunt-resistant variety of considerable agricultural value may be yielded by further selection, since a number of the row selections from this cross in 1932 and 1933 appeared to combine the desirable qualities of both parents.

YU (T. F.), CHEN (H. K.), & HWANG (L.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.) II.**—*Agric. Sinica*, i, 3, pp. 79–81, 1934. [Chinese summary.]

A fully tabulated account is given of experiments conducted at Nanking, China, from 1925–33, inclusive, on the reaction to flag smut (*Urocystis tritici*) of 3,479 wheat strains from the provinces of Shantung, Honan, and Kiangsu [*R.A.M.*, xiii, p. 19]. Throughout the eight-year period 72 of the selections tested showed a high degree of resistance to the disease as compared with the susceptible controls, coupled with a satisfactory habit of growth. Fifty-five of these resistant strains are now undergoing tests for yield, early maturity, and reaction to flag smut collections from regions at a distance from Nanking.

STEINER (H.). **Ein Beitrag zur Frage der Getreiderostbekämpfung auf kulturellem Wege.** [A contribution to the question of cereal rust control by cultural methods.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 7, pp. 348–354, 1934.

The writer discusses in general terms the possibilities of combating cereal rusts (*Puccinia triticina*, *P. glumarum*, and *P. graminis* on wheat and *P. dispersa* [*P. secalina*] on rye) in Austria [*R.A.M.*, xiii, p. 292] by cultural methods, e.g., adjustment of sowing dates to avoid exposure of the plants to infection during critical periods, and the destruction of the usually heavily infested volunteer plants. The conclusion is reached that such means may form a valuable adjunct to the work of breeding for immunity, the latter, however, remaining indispensable to the final solution of the rust problem.

STAKMAN (E. C.), LEVINE (M. N.), COTTER (R. U.), & HINES (L.) **Relation of Barberry to the origin and persistence of physiologic forms of Puccinia graminis.**—*Journ. Agric. Res.*, xlviii, 11, pp. 953–969, 3 maps, 1934.

This is a summarized account of the results obtained by the authors up to date in their studies of the part played by barberries in the United States in the production and perpetuation of physiologic forms of *Puccinia graminis* in nature, some preliminary information on which has been published in a previous communication [*R.A.M.*, xi, p. 437]. Of the 675 aecidial collections tested on wheat, rye, and oats, 281 caused infection, of which 34·2 per cent proved to be of the *tritici*, 63·7 per cent. of the *secalis*, and 2·1 per cent. of the *avenae* variety, the relative prevalence of the varieties being probably largely governed by the distribution of wild grasses susceptible to them. Of 138 uredospore collections of the rust obtained within 100 yds. from rusted barberries, 52·2 per cent. were *tritici*, 32·6 *secalis*, and 15·2 per cent. *avenae*, this distribution having probably been partly influenced by the conscious selection of hosts known to be susceptible to certain rust varieties. The results of the investigation, supported by other observations, would indicate that stem [black] rust of rye (*P. g. secalis*) is almost entirely dependent on barberries for its persistence in the United States.

While the identification of 94 aecidial collections of *P. g. tritici* showed the presence of 26 physiologic forms (i.e., a different form for approximately every four collections), only one different form was isolated from about every 100 uredo collections out of a total of about 8,000 made at random during a number of years. Of these forms, 36 and 38 were the most prevalent; forms 62, 102, 104, and 105 were only isolated from rusted barberries. From 71 uredospore collections of black wheat rust made close to barberry bushes, isolations gave 19 physiologic forms, one of which (form 48) has never been found elsewhere in the United States, although it has been reported several times from Canada.

Nine physiologic forms of *P. g. secalis* were isolated from 27 aecidial collections, and 8 forms from 28 uredospore collections made in the vicinity of rusted barberry bushes, while uredospore collections made at random yielded a considerably smaller proportion of physiologic forms to the total number of collections. The most prevalent forms were 7 and 11; form 14 was only isolated from aecidial collections.

The six aecidial collections of *P. g. avenae* that were identified consisted of forms 2 and 5, both of which are widely distributed in the United States. A new form (10) was isolated from oats near rusted barberries; it is far more virulent on the Richland groups of oat varieties than the two other forms.

In greenhouse inoculations of barberry with teleutospore material, the ratio between the number of teleutospore collections used and the number of physiologic forms subsequently isolated was 4·83 to 1 for *P. g. secalis*, and 1·76 to 1 for *P. g. tritici*; the latter forms included 67, 96, and 127 which were never obtained from uredospore material in the field, and another form (101) which was only found in the United States on artificially inoculated

barberries, but was isolated from uredospore material collected in Bulgaria.

The above results are considered to indicate that barberry is important in the production and persistence in nature of physiologic forms of *P. graminis*, especially the *secalis* variety, and probably also of *P. g. agrostidis* and *P. g. poae*.

HASSEBRAUK (K.). **Die Bedeutung der Bodenfeuchtigkeit für das Verhalten von Puccinia graminis und Puccinia triticina auf verschiedenen Weizensorten.** [The importance of soil moisture in the behaviour of *Puccinia graminis* and *Puccinia triticina* on different Wheat varieties.]—*Phytopath. Zeitschr.*, vii, 3, pp. 259–269, 1934.

A tabulated account is given of the writer's inoculation experiments at the Brunswick Institute of Agricultural Botany with *Puccinia triticina* and *P. graminis* on seedlings of a number of different wheat varieties in rich garden soil adjusted to 25, 50, and 75 per cent. of its water-holding capacity [*R.A.M.*, xiii, p. 83].

With *P. graminis* enhanced resistance developed, almost without exception, parallel with an increasing water content, and at 75 per cent. there was an access of chlorosis and a diminution of pustule numbers; the incubation period, however, was shortest at this moisture content. No correlation could be traced between the moisture requirements of a given wheat variety and its reaction to *P. graminis* at different soil moistures.

The results with *P. triticina* were much less clear-cut, varying greatly with the different types of wheat, though here again there was no parallel between the incidence of infection at a given soil moisture and the ecological requirements of the variety. Chlorosis increased uniformly with a rising water content, but the number of pustules formed was greatest in some varieties at the highest, and in others at the lowest moisture. The incubation period of the rust was shortest at 75 per cent. and almost consistently longest at 50 per cent.

CALDWELL (R. M.), KRAYBILL (H. R.), SULLIVAN (J. T.), & COMPTON (L. E.). **Effect of leaf rust (Puccinia triticina) on yield, physical characters, and composition of winter Wheats.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1049–1071, 1 fig., 3 graphs, 1934.

This is a full report of the results [given in tables and graphs] obtained by the authors in their study [a preliminary abstract from which has already been noticed: *R.A.M.*, xi, p. 440] of the effect of leaf [brown] rust (*Puccinia triticina*) on the yield, physical characters, and composition of winter wheats at La Fayette, Indiana, in 1931. This season was very favourable owing to the severity of the rust and absence of other serious diseases, all other conditions being in favour of high yields. In addition to the information already given, it is stated that the yield in grain and straw of very susceptible varieties (except Fulhard) was reduced by from 14·8 to 28·4 per cent., the reduction being approximately proportional to the severity of the rust.

Nearly 75 per cent. of the losses were caused by reduction in the number of grains in each ear, the remainder resulting from a reduction in weight per grain. An outstanding effect of the rust was the considerably increased proportion of yellow-berry or piebald grains in the hard and semi-hard varieties, and the production of grains more uniformly soft or starchy in the soft ones. The standard weight per bushel was slightly but consistently reduced. The starch content of the mature grain varied inversely with the protein percentage, which was very significantly reduced by severe infection. Sucrose was also reduced both in the mature grain, and in the culms and leaves of rusted plants at the nearly ripe stage. The percentages of phosphorus and total ash of the grain were not appreciably affected.

The macroscopical characters and composition of the grain of the highly resistant Fultz selection wheat showed no visible signs of being directly affected by sulphur dusting.

STROEDE (W.). **Untersuchungen über die geographische Verbreitung der physiologischen Formen des Weizenbraunrostes, Puccinia triticina Erikss. in Deutschland.** [Investigations on the geographical distribution of the physiologic forms of brown rust of Wheat, *Puccinia triticina* Erikss., in Germany.] —*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 115–120, 1934.

A tabulated account is given of the writer's analysis in 1932, for the occurrence of physiologic forms, of 45 collections of brown rust of wheat (*Puccinia triticina*) [*R.A.M.*, xiii, p. 689] from different parts of Germany. The following forms were found to be present: XI, XIII, XIV, XV, XVI, XX, XXI, and XXII, of which, as already observed by Scheibe, XI and XIV predominated [cf. ibid., ix, p. 768; xi, p. 231]. No evidence was forthcoming for a strict correlation between a given physiologic form and a definite region, though possibly some forms tend to be more freely distributed in one area than in another.

GASSNER (G.) & FRANKE (W.). **Über den Einfluss der Temperatur auf Stickstoffgehalt und Rostresistenz junger Getreidepflanzen.** [On the influence of temperature on the nitrogen content and rust resistance of young cereal plants.]—*Phytopath. Zeitschr.*, vii, 3, pp. 315–326, 1934.

Several wheat (Strubes and v. Rümkers Sommer Dickkopf, Malakoff, Carstens V, Michigan Amber, and Siegfried) and rye (Petkus winter and summer) varieties were tested for their content in albumin and soluble nitrogen compounds when grown in sand cultures with a nutrient solution at temperatures of 5°, 10°, and 20° C. under otherwise uniform experimental conditions [*R.A.M.*, xiii, p. 566].

The albumin content was found to rise sharply with a decline in temperature, while the soluble nitrogen compounds either remained stationary or showed a fluctuating and insignificant tendency to increase. If these facts are considered in the light of the established tendency of certain rusts (especially *Puccinia triticina* and *P. glumarum*) to cause heavier infection at low than at high

temperatures [ibid., xi, p. 231], the conclusion can be reached that the heavy increase of albumin accompanying a falling temperature predisposes the wheat plants to attack by these fungi.

GASSNER (G.) & STRAIB (W.). **Experimentelle Untersuchungen zur Epidemiologie des Gelbrostes (Puccinia glumarum [Schm.] Erikss. und Henn.).** [Experimental investigations on the epidemiology of the yellow rust (*Puccinia glumarum* [Schm.] Erikss. and Henn.).]—*Phytopath. Zeitschr.*, vii, 3, pp. 285–302, 1934.

In confirmation of previous results the writers found that most wheat varieties tend to show greater resistance to yellow rust (*Puccinia glumarum*) at high temperatures (average 22° to 23° C.) than at low ones (up to 15°) [*R.A.M.*, viii, p. 361; ix, p. 99; x, p. 714]. The present tests were carried out on 31 German and American wheat varieties for which physiologic forms 2, 4, 7, and 9 of *P. glumarum* [ibid., xii, p. 273] served as inoculum.

Considerable differences were observed among the varieties and the forms of the rust as regards the 'critical temperature' at which the transition from susceptibility to resistance is effected. Thus, the winter variety Criewener 104 is highly susceptible to forms 2, 4, and 7 at 21°, at which temperature, however, it has already acquired resistance to 9; for Ackermanns Bayernkönig the critical temperature is much lower for form 7 than for the others used in the tests. Carstens Dickkopf V was the only wheat tested that showed complete susceptibility at 23°. Similar disparities in reaction to the various physiologic forms of yellow rust at different temperatures were observed among the summer wheats, of which Heines Kolben proved susceptible to form 9 even at a mean temperature of 24·3°. All the ten South American wheat varieties tested were highly susceptible to form 9 at 21°, whereas half of them acquired resistance to the remaining forms between 15° and 21°. Even at 24·3° four varieties, Oregon, Universal II, Alto da Sierra, and Rosafé, were still susceptible to form 9.

It is evident from these data that the importance of a given physiologic form of *P. glumarum* from the standpoint of wheat cultivation and breeding for immunity lies in its capacity to induce heavy infection and to reach the stage of sporulation under summer conditions in the field, which are normally adverse to the rust and favourable to the host. Varietal reaction to yellow rust should be tested in the first place in the greenhouse at both low and high temperatures, the former serving as a criterion of absolute resistance or immunity, while the latter indicate relative resistance and enable the prospects of 'summer resistance' to be gauged.

GASSNER (G.) & STRAIB (W.). **Untersuchungen über das Auftreten biologischer Rassen des Weizengelbrostes im Jahre 1932.** [Investigations on the occurrence of biologic strains of yellow rust of Wheat in the year 1932.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 59–72, 1934.

A tabulated account is given of the classification into physiologic forms of 77 collections of yellow rust of wheat [*Puccinia glumarum*], all but six of which (from Austria, Hungary, England,

Sweden, Finland, and Canada) originated in Germany in 1932 [see preceding and next abstracts].

Eleven physiologic forms were differentiated on the basis of their behaviour on ten standard varieties. These varieties were the same as those used in previous work [*R.A.M.*, xii, p. 272] with the addition of Rouge prolifique barbu. Chinese 166 was still used as a supplementary variety. Of the rust forms, numbers 2, 3, 4, 5, 7, 8, 9, and 12 are already familiar from previous studies, whereas 15, 16, and 17 are new. Form 15, isolated from Austrian and Finnish material, differs from the nearly related 12 only in its aggressive attack on Spalding's Prolific. Form 16, from Germany and Finland, closely allied to 9, is distinguished by its failure to infect Heines Kolben, while 17 (west Germany) may be separated from 7 by its virulence on Spalding's Prolific and Webster C.I. 3780; Carstens V is resistant to this form.

The prevalence of the different forms was observed to vary greatly according to the wheat varieties predominating in a given locality. The commonest in the main German wheat areas were 2, 3, and 5, while 7 and 8 were also frequently collected. Form 8 was also obtained from Swedish and Canadian material [cf. ibid., xiii, p. 689].

GASSNER (G.) & STRAIB (W.). **Weitere Untersuchungen über biologische Rassen und über die Spezialisierungsverhältnisse des Gelbrostes Puccinia glumarum (Schm.) Erikss. und Henn.** [Further investigations on biologic forms and on the specialization relations of the yellow rust *Puccinia glumarum* (Schm.) Erikss. and Henn.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 121–145, 1934.

A detailed, fully tabulated account is given of the writers' analysis, for the occurrence of physiologic forms, of 95 samples of yellow rust of wheat (*Puccinia glumarum*) obtained during 1933 from 59 localities in Germany, Austria, Hungary, Bulgaria, Turkey, France, Holland, England, Sweden, and Finland.

On the basis of their behaviour on eleven differential varieties of wheat (the same as those used in determining the forms in 1932) [see preceding abstract], 18 physiologic forms were separated, of which five (18 to 22, inclusive) are described as new, bringing the total for the species to 22. Forms 18 and 19 originated in Turkey, 20 in Bulgaria, 21 in Finland, and 22 in Germany. The first does not attack Strubes Dickkopf, Vilmorin 23, and Carstens V, thus differing from the related form 14. Vilmorin's red Scotch wheat is highly resistant to form 19, which in other respects resembles 10. Form 20 is similar to the foregoing except for its greater severity on Webster C.I. 3780. Form 21 differs from the two foregoing in its virulence towards the red Scotch wheat, and from the closely allied 10 in its failure to attack Strubes Dickkopf and Carstens V. The Prolific Red Bearded variety (Rouge prolifique barbu) is the only one differing appreciably in its reactions to 17 and 22, the latter in general causing a heavier type of infection, though with occasional deviations to a milder form which complicate separation. The geographical distribution of the physiologic

forms in different years is correlated, not only with the predominance of given wheat varieties in a certain area, but also with the fluctuations in varietal reaction induced by climatic factors.

The form of *P. glumarum* occurring on barley and couch grass (*Agropyrum repens*) in nature was found to correspond with form 4 from wheat. It was experimentally shown that all the physiologic forms of yellow rust so far differentiated, with the exceptions of 9 and 16, were capable of infecting six barley varieties, while all could attack *A. repens*. Most of the 38 rye varieties tested for their reaction to 14 of the forms of *P. glumarum* proved immune or highly resistant, but by means of selfing and crossing susceptible individuals it was possible so to increase the percentage of infection as to explain Eriksson's and Henning's statement (*Zeitschr. für Pflanzenkrankh.*, iv, [p. 197], 1894) as to the spontaneous occurrence of yellow rust on this host. Seven forms of *P. glumarum* were further found capable of infecting *Elymus junceus*. On the basis of these results it is considered impossible to maintain Eriksson's sub-division of the species into formae speciales. In future the yellow rust should be designated simply *P. glumarum*, irrespective of the host on which it is found, this species consisting of a great number of biological races or biotypes.

GARRETT (S. D.). **Factors affecting the pathogenicity of cereal root-rot fungi.**—*Biol. Reviews*, ix, 3, pp. 351–361, 2 graphs, 1934.

From an examination of all the available published work [which is briefly summarized and discussed] on the effect of soil temperature and moisture content on the incidence of foot rots on cereals, the writer concludes that the microbiological equilibrium of the soil plays an important part in the relative prevalence of the various agents of these disorders in different soil types. It seems probable, however, that the root-rotting fungi (including *Ophiobolus graminis*, *Gibberella saubinetii*, *Fusarium culmorum*, *Helminthosporium sativum*, and *Pythium arrhenomanes* var. *canadensis* [*R.A.M.*, xi, p. 434]) vary considerably in their susceptibility to biological antagonism [cf. ibid., xiii, p. 362]. Still more significant may be the variations in the physiological state of the mycelium under divergent soil conditions, the hyaline, thin-walled mycelium rich in protoplasm generally formed on an organic substratum probably being much more susceptible to adverse microbiological factors than the dark-coloured, resistant 'runners' whereby certain fungi spread through an inhospitable soil [ibid., xiii, p. 433].

It is possible that considerations of this order may ultimately throw light on the problem of the distribution of cereal foot-rotting pathogens in wheat-growing countries. In Australia, for instance, *H. sativum* is the chief root-rotting parasite of wheat in New South Wales, whereas in South Australia *O. graminis* is responsible for almost the entire damage [loc. cit.]. Extensive isolations have shown, however, that *H. sativum* is widely distributed in South Australian soils, where its failure to cause serious injury is thus in need of explanation.

FRON [G.]. **Sur la présence de Fusarium à la base des chaumes de Blé lors de l'épiaison.** [On the presence of *Fusarium* at the base of Wheat haulms at heading time.]—*Comptes rendus Acad. d'Agric. de France*, xx, 22, pp. 740–742, 1934.

Fusarium culmorum is stated to have been unusually prevalent on wheat, causing a basal stalk rot, in the plain of Chartres, in Seine-et-Oise, and in the Meaux region of France during the summer of 1934 [cf. *R.A.M.*, xiii, pp. 503, 569]. Conidia are produced in abundance on the stalks which, in affected plants, are reduced in numbers (sometimes to one), short, and with stunted, yellow, sterile ears.

CHIAPPELLI (R.). **La golpe bianca del Frumento (Fusarium roseum).** [The white blight of Wheat (*Fusarium roseum*).]—*Giorn. di Risicolt.*, xxiv, 7, pp. 147–148, 1 fig., 1934.

Attention is drawn to the recent occurrence in Italy of white blight (*Fusarium roseum*) [*Gibberella saubinetii*: *R.A.M.*, xiii, p. 157] on the Damiano Chiesa, Mentana, and Ciro Menotti wheat varieties, the losses in the first-named amounting to as much as 30 per cent. of the crop. A brief note is given on the symptoms of the disease and its control.

WALDRON (L. R.). **Increase of kernel weight in common Wheat due to black-point disease.**—*Journ. Agric. Res.*, xlviii, 11, pp. 1017–1024, 1934.

This is a tabulated account of the author's investigation of the effect of black point [*R.A.M.*, x, p. 20], associated in the samples tested with *Helminthosporium sativum* and a species of *Alternaria*, in about equal proportions, on the relative weight of wheat grains, during a heavy outbreak of the disease on various common wheats (*Triticum vulgare*) at Fargo, North Dakota, in 1933. In the five hybrids studied the weight of the black-point grains on any one plant was generally greater than that of the apparently non-infected grains (33·1 to 38·4 as against 27·1 to 32·2 gm. per 1,000 grains, respectively). Within any given grain group on the ear, e.g. the third floret group, the black-point grains were also significantly heavier than the clean ones. In one experiment, a coefficient of correlation of $0{\cdot}22 \pm 0{\cdot}04$ was established between the percentage of black point and total yield, and a coefficient of $0{\cdot}32 \pm 0{\cdot}04$ between black point percentage and weight of 1,000 grains. In a study of individual plants in another hybrid, a correlation coefficient of $-0{\cdot}09 \pm 0{\cdot}04$ was found between the percentage of black point and the yield of grain per plant, but the coefficient of correlation between black point and the weight per 1,000 grains was still $0{\cdot}32 \pm 0{\cdot}03$.

These results are considered to indicate that a portion of the weight differences is caused by a stimulation of the development of the endosperm, following the penetration of the fungus into the developing ovule, although they may also be attributed in part to a difference in infection of grains differing normally in size because of their position in the ear.

GASSNER (G.) & KIRCHHOFF (H.). **Versuche zur Bekämpfung des Gerstenflugbrandes.** [Experiments in the control of loose smut of Barley.]—*Phytopath. Zeitschr.*, vii, 3, pp. 303–314, 1934.

The following methods are recommended, on the basis of recent experiments [which are tabulated], for the control of loose smut of barley [*Ustilago nuda*]: (1) three hours' immersion in water at 41° to 43° C. with the addition of 2 per cent. methylated spirit; and (2) one hour's moistening in a closed vessel containing 5 l. water at 50° to 52° per cwt. of seed-grain with an admixture of 3 per cent. methylated spirit [see above, p. 750].

YU (T. F.), CHEN (H. K.), & HWANG (L.). **Varietal resistance and susceptibility of foreign Barleys to covered smut (Ustilago hordei (Pers.) K. & S.)**—*Agric. Sinica*, i, 3, pp. 83–89, 1934. [Chinese summary.]

A fully tabulated account is given of experiments initiated by R. H. Porter in 1925 and continued by the writers up to 1933 on the varietal reaction of 367 foreign barleys to *Ustilago hordei* at Nanking, China [*R.A.M.*, v, p. 656; ix, p. 29]. The seeds were dehulled by hand [ibid., iii, p. 330] and thoroughly mixed with covered smut spores of local origin. A large number of the selections remained free from the disease during the eight-year period of the trials, but owing to their late maturing habit they are unsuitable for cultivation in the Nanking district. They should, however, prove useful in breeding work on account of their resistance to covered smut and other desirable qualities.

RONSDORF (LISELOTTE). **Einige Versuche über biologische Rassen des Gerstenzwergrostes.** [Some experiments on biologic strains of the dwarf rust of Barley.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 109–114, 1934.

Six collections of dwarf [brown] rust of barley (*Puccinia anomala*) from different parts of Germany were analysed for the occurrence of physiologic forms on the basis of their behaviour on the ten standard varieties used by Hey [*R.A.M.*, xi, p. 36], with the addition of a four-rowed Egyptian summer barley which proved useful in separating the new form IX from forms II and IV.

The presence of physiologic forms III, IV, and IX was established, the last-mentioned (from the Danzig district) being new and distinguished mainly by its capacity for severe infection on the Australian Recka variety. The results of Hey's tests with forms II to V, inclusive, were substantiated in the main by the writer's experiments, except that Hey's forms II and V were difficult to separate in the author's tests, and that all produced usually a somewhat more virulent type of infection. The influence of varying temperatures on the incidence of attack by the different physiologic forms on certain barley varieties was confirmed [loc. cit.].

CHRISTENSEN (J. J.). **Nonparasitic leaf spots of Barley.**—*Phytopath.*, xxiv, 7, pp. 726–742, 6 figs., 1934.

No evidence of parasitic origin could be detected in certain types of leaf spotting of barley occurring in certain seasons in Minnesota and in some cases simulating those due to *Helminthosporium sativum* and *H. gramineum*. Some of these appear to be heritable, while others may be the result of malnutrition or of the presence of boron in the soil; the latter substance, supplied either in the form of boric acid (10 to 20 gm. per sq. m.) or sodium borate (0·1 or 0·2 gm. per pot), caused lesions resembling the spot blotch due to *H. sativum* on a number of standard varieties including Glabron, Manchuria, Minsturdi, Black Hull-less, Lion C.I. 923, New South Wales Selection, and Purple Nudum C.I. 2250. Field and greenhouse tests and observations extending over a number of years indicate that varietal behaviour in respect of the non-parasitic leaf spots is relatively stable. Barley leaves injured by boron were not rendered more susceptible to *H. sativum* or more resistant to *Erysiphe graminis* than untreated plants, though the latter may be less apparent owing to the diminished area of healthy leaf tissue suitable for the growth of the parasite. The non-parasitic leaf spots appeared at different stages in the vegetative growth of the 125 varieties studied and were not prevented by spraying or dusting with sulphur, iron, or manganese compounds.

STANTON (T. R.), REED (G. M.), & COFFMAN (F. A.). **Inheritance of resistance to loose smut and covered smut in some Oat hybrids.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1073–1083, 2 graphs, 1934.

This is a brief, tabulated account of the authors' study [cf. *R.A.M.*, xiii, p. 570] of the inheritance of resistance to two biological forms (Missouri and Fulghum) of oat loose smut (*Ustilago avenae*) and the Missouri strain of covered smut (*U. levis*) [*U. kolleri*] in the F_2 and F_3 generations of six oat crosses, namely, Richland × Markton, Richland × Fulghum, Markton × Iogold, Markton × Black Mesdag, Cornelian × Markton, and Monarch Selection × Black Mesdag. Black Mesdag and Markton are highly resistant to both smuts, Iogold and Cornelian rather highly susceptible, and Richland and Fulghum rather resistant, except Fulghum to its own strain of *U. avenae*, from which most of the other varieties are immune, Monarch Selection being very susceptible to *U. avenae* (Missouri) but very resistant to *U. kolleri*. In most of the hybrids tested, completely resistant progenies predominated over segregating progenies, with very few susceptible descendants. The results obtained from inoculating F_3 plants of two Monarch Selection × Black Mesdag hybrids with the Missouri form of *U. avenae* indicated a simple dominance for resistance to this smut, segregation occurring on the basis of a 3 to 1 ratio. The fact that when F_2 plants of the cross between the two entirely resistant Markton and Black Mesdag varieties were inoculated with the Fulghum form of *U. avenae*, 25 per cent. of the F_3 progenies were smutted may indicate that both varieties may carry complementary factors for susceptibility, which, when brought together through hybridization, may result in susceptibility.

SĂVULESCU (T.) & RAYSS (T.). **Quelques réactions du champignon 'Nigrospora oryzae' (B. et Br.) Petch, parasite sur le Maïs.** [Some reactions of the fungus *Nigrospora oryzae* (B. & Br.) Petch parasitizing Maize.]—*ex* Livre publié en Hommage et dédié à la Mémoire du Professeur Cantacuzène, pp. 661–677, 7 figs., Masson et Cie. [Paris], 1934.

In continuation of their studies on *Nigrospora oryzae* on maize in Rumania [*R.A.M.*, xiii, p. 571], the authors give a detailed account of microchemical tests which failed to reveal the presence of cellulose or pectose and pectic compounds in the mycelial membranes of the fungus; the membranes were shown to contain callose and chitin, and to be permeated on the outside with fatty acids which render them impervious to the action of acids and to the penetration of stains. Further experiments showed that the mycelium of *N. oryzae* exerts a diastatic action on cellulose, which is broken down to a hydrocellulose with a less complex molecule. This action is a direct function of the moisture content of the substratum, a fact which explains the preference of the fungus for the *dentiformis* variety of maize, the rachis of which is richer in water than that of the common Rumanian variety (*vulgata*).

TANAKA (I.). **Eine neue Art des falschen Mehltaupilzes auf dem Buchweizen.** [A new species of the downy mildew fungus on Buckwheat.]—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 203–206, 3 figs., 1934.

Peronospora fagopyri I. Tanaka sp. nov., the agent of a destructive leaf blight of buckwheat (*Fagopyrum esculentum*) in Japan, is characterized by an effuse, greyish-purple mycelium; conidiophores mostly arising in groups of three from the stomata, 240 to 440 by 8 μ, 4 to 6 times dichotomously branched near the apex; dingy purple, ellipsoid conidia, 20 to 30 by 14 to 18 μ; spherical oogonia, 52 to 55 μ in diameter; and yellowish-brown to dark brown oospores, 25 to 30 μ in diameter. A table is given showing the differences between the species under observation and four species already known on Polygonaceae, namely, *P. rumicis* on *Rumex* spp., *P. polygoni* and *P. americana* on *Polygonum* spp., and *P. jaapiana* on rhubarb [*R.A.M.*, v, p. 279].

[No mention is made of *P. ducometi* Siem. & Jankow. (syn. *P. fagopyri* Jaczewski): ibid., xii, p. 550.]

WILLIAMS (R. O.). **Wither-tip disease and Limes.**—*Proc. Agric. Soc. Trinidad and Tobago*, xxxv, 7, pp. 275–282, 1934.

Wither-tip of limes (*Gloeosporium limetticolum*) [*R.A.M.*, xii, pp. 22, 143, 689] which in the American tropics occurs from the Florida Keys to British Guiana and is present on most of the West Indian islands, first appeared in Trinidad in 1917, reducing the export of juice from 29,000 galls. in that year to nil in 1922. It was first reported from Dominica [ibid., xiii, p. 684] in the latter year, since when, in conjunction with other factors, it has reduced the export of limes from 516,000 to under 50,000 barrels a year. In 1933, it was discovered in Grenada, where it has already rapidly increased in prevalence and intensity. The considerable reduction

in yield due to infection varies with the amount and distribution of the rainfall. In Dominica, limes growing in regions of an elevation of 1,000 ft. and an annual precipitation of 180 in. have been entirely killed out as a result of continuous infection of the young flushes. On one property with 100 in. rainfall the yield has fallen from 150 to 100 barrels per acre, and the best yield obtainable in the island is now only 150 barrels per acre, as compared with 200 formerly.

Spraying once or twice with lime-sulphur (1 in 30 or 1 in 40) when the trees are flushing and flowering would give beneficial results in dry localities in Trinidad where there is a definite main flowering period, but is uneconomic in wet ones.

In 1925, cross-breeding trials were begun in Trinidad between the West Indian lime and a resistant seedling (No. 2182) obtained from the Philippine Islands; with the former as the female parent, two resistant hybrids, T_1 and T_6, were obtained which were selected for field trials. The former proved to have the more desirable characters [which are described], and T_1 limes are now being dispatched regularly to New York and Canada, where they realize the same price as the ordinary West Indian limes.

WINSTON (J. R.). **Preparation and packing of Oranges for shipment.**—*Indus. & Engin. Chem.*, xxvi, 7, pp. 762–765, 1 diag., 3 graphs, 1934.

Attention is drawn to the necessity of applying the 8 per cent. borax wash, which has given such good control of the stem-end rots of citrus caused by *Diplodia* [*natalensis*] and *Phomopsis* [*Diaporthe citri*: *R.A.M.*, xiii, p. 26] as soon as possible after harvesting and before colouring. A momentary dip in the solution at 110° F. has been found to be equally effective with a longer bath; the borax should be allowed to remain on the fruit from two to three days. The most practical method of giving the borax treatment is to float the fruit through long tanks containing the heated solution. The fruit should be pre-cooled immediately after packing; in Florida this process is generally conducted in rooms at a temperature of 32° or below provided with an air blast of 5,000 cu. ft. per minute, the direction of which is changed hourly, reducing the temperature of the fruit to well below 40° within 24 hours. Thereafter a temperature of 40° to 45° should be maintained in the storage rooms.

VAN DER PLANK (J. E.). **Observations on the infection of Navel Oranges by green mould (Penicillium digitatum, Sacc.).**—*S. Africa Dept. of Agric. Sci. Bull.* 127, 20 pp., 1 pl., 3 graphs, 1934.

In a study made in South Africa of the sources of infection by *Penicillium digitatum* [*R.A.M.*, xii, p. 168] in ordinary boxes of oranges young lesions below a certain given size were classified according to the way in which infection had started, five classes being recognized, viz., puncture, injury, stem-end, navel-end, and undetermined. The first class comprised infections developing at well-defined punctures (possibly of insect origin) penetrating into but not beyond the albedo. Infections of the injury class arose

from any visible wound other than a puncture; these wounds affected the albedo and sometimes extended into the juice tissues. The stem-end class consisted of pure green mould infections beginning as a small, soft, water-soaked area to the side of the button, and not associated with visible injuries or fungi other than *P. digitatum*. Infections placed in the navel-end class started at that end, but the exact point of origin was rather variable. The undetermined class included all infections that could not be grouped in the other classes. In the consignments examined in 1931 after removal from cold storage the proportion of the total wastage due to each class was puncture, 13·8, injury, 4·2, stem-end, 61·2, navel-end, 9, and undetermined, 11·8 per cent., the corresponding figures for 1932 being 17·9, 13·1, 52·4, 9·5, and 7·1 per cent.

The evidence obtained indicated that the stem- and navel-end types of decay were due to infection without previous injury, though such infection was rare except at these two points.

There were no appreciable amounts of contact wastage or wastage arising merely from the presence of infected fruits in the boxes. The proportion of wounds to become infected by *P. digitatum*, as estimated by counting infections visible up to three weeks after discharge from cold storage, was under 25 per cent.

REED (H. S.) & FRÉMONT (Mlle T.). **Sur les réactions des cellules de racines de Citrus à l'infection par les mycorrhizes.** [On the reactions of Citrus root-cells to mycorrhizal infection.]—*Comptes rendus Acad. des Sciences*, cxciv, 1, pp. 84–87, 2 figs., 1934.

This is a slightly expanded account of the writers' observations in California on the cytological reactions of citrus roots to mycorrhizal infection (stated to occur also in specimens received from Sicily, Formosa, and Malaya), a note on which has already appeared [*R.A.M.*, xiii, p. 589].

OCFEMIA (G. O.). **Bud rot of Coconut.**—*Philipp. Agric.*, xxiii, 1, pp. 4–10, 2 figs., 1934.

A semi-popular account is given of the bud rot of coco-nut palms caused by *Phytophthora palmivora* [see below, p. 813] in the Philippines and elsewhere, with directions for its control by appropriate cultural measures.

Report of committee on Coffee berry disease.—*Kenya Dept. of Agric. Bull.* 3 *of 1934*, 20 pp., 1934.

In Kenya, coffee berry disease [apparently due to a strain of *Glomerella cingulata*: *R.A.M.*, xii, p. 8], first reported in 1922, causes considerable annual loss to growers, in some cases amounting to 75 per cent. of the crop. At present it appears to be confined to the west of the Great Rift Valley, and is serious only at altitudes of about 5,500 ft. or over. A small experiment station devoted to the study of the disease has been established in Sotik. Field observations and experiments [which are described, and the results of which are tabulated and discussed] conducted in 1933 to investigate the factors affecting the incidence of the disease indicated that the destructive effect of infection is due to the expansion of

the plantation system into an area where the conditions are more suitable to the fungus than to the Mocha type of coffee grown. The variation in the susceptibility of different bushes, shown even when young and under apparently identical conditions, was very noticeable. A small area of Blue Mountain coffee has hitherto shown marked resistance. The paper concludes with a copy of a questionnaire regarding the disease sent to growers and an analysis of the replies received.

MASSEY (R. E.). **Studies on blackarm disease of Cotton. III.**— *Empire Cotton Growing Review*, xi, 3, pp. 188–193, 2 figs., 1934.

Further field and laboratory investigations conducted in the Sudan into cotton blackarm [*Bacterium malvacearum*: *R.A.M.*, x, p. 661; xiii, p. 696] showed that at soil temperatures between 25° and 30° C., increase in soil moisture up to 40 parts of water in 100 of dry soil resulted in increased germination and increased blackarm infection; at 50 parts of water to 100 of dry soil both were reduced. Maximum infection resulted when the soil temperature fell at some time between 24 and 48 hours after sowing. When Gezira soil was added to cultures of *Bact. malvacearum* the pathogenic smooth form was largely transformed into the non- or feebly pathogenic rough form. For infection to take place the organism had to enter the tissues of the germinating seed within 72 hours of sowing [ibid., x, p. 662], but once entry is effected, changes in soil moisture or temperature taking place after this critical period do not greatly affect the progress of the disease.

Seed disinfection by means of home-made machines consisting of 40-gallon oil drums slung diagonally on a horizontal axle supported on trestles and turned by hand was found to be very effective, 20 such drums dusting 600 sacks, each containing 270 lb. of seed, in 5 hours; the addition of a little water to the seed facilitated the operation.

Lesions developed in the open at a relative humidity of only 25 per cent. (maxima shade temperatures about 33°, minima 16°), when the leaves were sprayed with sufficient force to overcome surface tension and the leaf surface was thoroughly wetted; the incubation period was, however, prolonged to 10 or 12 days in such dry air. With relative humidities of 60 to 75 per cent. and temperatures ranging from 40° to 30° the incubation period was frequently reduced to 3 days. Many more lesions were obtained with a warm spray (32°) than with one cooled to 10°. The highest percentage of active lesions developed on healthy, rapidly growing plants with large leaf surfaces. Senescent tissues and leaves thickened by leaf curl were much more resistant than rapidly developing tissues; stem infections occurred only in very young tissues, and were derived primarily from a leaf via the petiole or from an axillary bud. The organism remained dormant for a long period on leaf surfaces which had dried before it had effected an entry.

Bact. malvacearum was not isolated from seed-bed soil except when infected plant remains were present. Dry, woody tissues retained the organism in a viable condition for a long period, alternate wetting and drying, unless frequently repeated, failing to sterilize such material. More fragile tissues, such as leaves and

bracts, when reduced to powder lost their infectiousness in four months, but may be an important means of spread during prolonged rains. Fallen bolls containing infected seed are a very dangerous source of carry-over, as the germination of the enclosed seed may be delayed until the new crop is established.

TAUBENHAUS (J. J.) & CHRISTENSON (L. D.). **Insects as possible distributing agents of Cotton wilt caused by Fusarium vasinfectum.**—Abs. in *Phytopath.*, xxiv, 7, pp. 839–840, 1934.

Fusarium vasinfectum, the agent of cotton wilt [*R.A.M.*, xiii, p. 698], was recovered in a viable and infective condition from the surface-sterilized bodies or faecal pellets of a number of insects [a list of which is given] fed on plant material known to be infected by the fungus. It is suggested that insects may play a part in the dissemination of the disease.

MÉTALNIKOV (S. S.). **Action des rayons solaires sur les spores de bactéries pathogènes pour les insectes.** [The action of solar rays on the spores of bacteria pathogenic to insects.]—*Ann. Inst. Pasteur*, liii, 1, pp. 93–99, 1934.

The information given in this paper on the effects of solar rays on *Bacterium* Cazaubon and *Bact. ephestiae* No. 1, pathogenic to the pink boll worm of cotton (*Gelechia gossypiella*) in Egypt, has already been summarized from another source [*R.A.M.*, xiii, p. 29]. *Bact. pyreneii* (black), isolated in France from *Pyrausta nubilalis* caterpillars on maize, is mentioned as being included in the trials with similar results to the foregoing.

MARCHIONATTO (J. B.) & VALLEGA (J.). **Ensayos a campo del 'hongo verde' ('Sporotrichum paranense' March.) de la langosta voladora.** [Field experiments with the 'green fungus' (*Sporotrichum paranense* March.) of the winged locust.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxv, 1–3, pp. 69–77, 6 figs., 2 graphs, 1933. [Received October, 1934.]

Particulars are given of field experiments in Santo Tomé and Paraná, Argentina, with the so-called 'green fungus' (*Sporotrichum paranense*) of the winged locust [*Schistocerca paranensis*: *R.A.M.*, xiii, p. 439], from which it appears that even under conditions relatively unfavourable to the fungal parasite a mortality of up to 65 per cent. of the insects may be attained by spraying the latter with spore suspensions. The effects of the fungus do not begin to be felt by the locusts for at least five days after inoculation, so that speedy destruction cannot be accomplished by this method. However, in view of its facility of cultivation and application the 'green fungus' should be further tested in districts where the locusts spend a considerable part of the winter.

DIDDENS (HARMANNA A.). **Schimmels bekend onder den naam Monilia.** [Fungi known under the name *Monilia*.]—Reprinted from *Antonie van Leeuwenhoek, Nederl. Tijdschr. voor Hyg., Microbiol. en Serol.*, i, 3, 11 pp., 7 figs., 1934.

Attention is drawn to the existing confusion in the nomenclature

of the yeast-like fungi grouped under the name of *Monilia* in text-books of medical mycology [*R.A.M.*, xiii, p. 635]. Vuillemin's classification, largely followed by medical workers, is considered to have given far too wide a definition to the genus *Monilia*, and even Berkhout's genus *Candida* [ibid., iii, p. 556] covers several more or less related genera. The hope is expressed that Langeron's and Talice's system of classification, in which *Candida* is split into the six genera [ibid., xi, p. 476] *Mycotorula*, *Mycotoruloides*, *Candida*, *Mycocandida*, *Blastodendrion*, and *Geotrichoides*, may be adopted pending further studies.

GIOVANNOLA (A.). **Sulla permanenza dei caratteri biochimici di alcune specie di Monilia mantenute in coltura per vari anni.** [On the permanence of the biochemical characters of certain species of *Monilia* maintained in culture for a varying number of years.]—*Ann. d'Igiène*, xliv, 7, pp. 641–645, 1934.

The writer examined the biochemical characters of five human pathogens of the *Monilia* group after varying periods in culture, namely, *Candida tropicalis*, *Monilia* (*Geotrichoides*) [*C.*] *krusei* (25 years each), *M.* (*Blastodendrion*) [*C.*] *pinoyi*, *M.* [*C.*] *pseudotropicalis* (24 years each), and *M. macedoniensis* var. *macedoniensoides* (17 years) [cf. *R.A.M.*, xiii, p. 635 and preceding abstract] and found them unaltered as judged by their behaviour on glucose, levulose, galactose, lactose, maltose, saccharose, and inulin at 37° C. [ibid., x, p. 663; xiii, p. 441].

CONNOR (J. I.) & MCKIE (MARGOT). **Pathogenicity of yeast-like fungi.**—*Med. Journ. of Australia*, xxi (ii), 2, pp. 52–53, 1934.

In addition to the strains of *Monilia* [*Candida*] *albicans* isolated from cases of paronychia at Melbourne [*R.A.M.*, xiii, p. 163], the writers have obtained four strains of *M. parapsilosis* [ibid., xiii, p. 370] from general moniliasis, web of toes, erosio interdigitalis, and blood culture, respectively. The organisms were differentiated by ordinary cross-agglutinin and agglutinin absorption tests, the results of which, together with the sugar reactions [see preceding abstract] of the groups of organisms hitherto found, are tabulated.

CIFERRI (R.) & REDAELLI (P.). **Histoplasma capsulatum Darling, the agent of 'histoplasmosis': systematic position and characteristics.**—*Journ. Trop. Med. & Hygiene*, xxxvii, 18, pp. 278–280, 1934.

The writers summarize the results of their studies on the agent of Darling's disease or histoplasmosis [*Posadasia capsulata*: *R.A.M.*, xiii, p. 637], cultivated for the first time in 1933 by De Monbreun from a case in Tennessee, United States.

Cultural dimorphism and reversibility are present, the colonies on common solid media at laboratory temperature being of a white, cottony type (hyphomycetic or III), while those on blood agar at 37° C. are small, greyish, globose, and yeast-like (type I); an intermediary type (II) is also observed. The cultures of type III consist of a white mycelium producing numerous rounded to piriform, smooth hypnospores, evolving into 'stalagmospores' with a thick, irregular, papillate, verrucose, or echinulate epispore, capable of

producing a germ-tube. On blood agar or a similar substratum at 37° the hypnospore forms a profusion of budding cells multiplying by the same process. On the inoculation of a type III culture into a guinea-pig, rabbit, or rat, the mycelium and stalagmospores are gradually absorbed, but the hypnospore produces blastospores (type I) within 24 hours; these represent the parasitic stage of the fungus.

As regards the taxonomy of *Histoplasma capsulatum*, the authors consider that it must be classified as a member of the Blastosporales *sensu lato* and they place it in a new family Histoplasmaceae Cif. et Red. A Latin diagnosis is given of the new family and an English one of the genus *Histoplasma* Darling (1906) emend. Cif. et Red.

Redaelli (P.) & Ciferri (R.). **Études sur l' 'Histoplasma capsulatum' Darling: I. Reproduction expérimentale de l'histoplasmose, et définition de la maladie comme réticulo-histocytose parasitaire atteignant divers systèmes de l'organisme.** [Studies on *Histoplasma capsulatum* Darling: I. Experimental reproduction of histoplasmosis and definition of the disease as a parasitic reticulo-histocytosis attacking different systems of the organism.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 6, pp. 193–195, 1934.

An account is given of experiments in which the authors succeeded in reproducing characteristic symptoms of histoplasmosis by means of inoculations of guinea-pigs and rabbits with pure cultures of the cottony growth of *Histoplasma capsulatum* [*Posadasia capsulata*: see preceding abstract], just as De Monbreun has already been able to do on monkeys with the yeast form. The organism is stated to have been considered by Darling (in 1907) a protozoon, but its fungal nature was recognized by Rocha Lima in 1912.

De Cisneros (J. M. G. J.). **Die Hyphenverschmelzung bei den Dermatophyten und ihre praktische Bedeutung für die Differenzierung.** [Hyphal fusion in the dermatophytes and its practical significance for differentiation.]—*Zentralbl. für Bakt.*, Ab. 1 (*Orig.*), cxxxii, 1–2, pp. 91–101, 1 pl., 3 figs., 1934.

Hyphal fusions were observed in only 8 out of 30 species of dermatophytes grown in pure culture in Grütz's maltose bouillon or dextrose bouillon, viz., *Parendomyces asteroides*, *Cephalothecium* [*Trichothecium*] *roseum*, *Achorion gypseum*, *Trichophyton gypseum asteroides* [*T. mentagrophytes*], *Microsporon ferrugineum*, *M. audouini*, *T. acuminatum* [cf. *R.A.M.*, xi, p. 458], and *Epidermophyton clypeiforme* [*E. floccosum*: ibid., x, p. 243]. When these were grown in culture with one another no fusions occurred between the hyphae of different species. Only in *P. asteroides*, *A. gypseum*, and *T. mentagrophytes* was fusion observed between different strains of the same species. The process can thus, in the writer's opinion, possess only a restricted and supplementary value as an aid to classification.

[An expanded account of these studies appears in *Atti Ist. Bot. Univ. Pavia*, Ser. IV, v, pp. 45–75, 25 figs., 1934.]

EBIHARA (M.). **Über einen auf einer der Inseln Izushichitoo aufgefundenen Trichophytonstamm; insbesondere über den Einfluss des Nährbodens auf die Entwicklung der Spindelsporen.** [On a *Trichophyton* strain detected on one of the Izushichitoo islands, especially on the influence of the medium on spindle spore development.]—*Japanese Journ. of Dermatol.*, xxxvi, 2, pp. 211–218, 8 figs., 1934. [Japanese, with German summary on pp. 40–41.]

From a superficial scalp affection of a ten-year-old boy on a Japanese island the writer isolated a variant of *Trichophyton coccineum* [*R.A.M.*, xii, p. 443], which was especially remarkable for its formation of spindle spores on Pollacci's medium with the addition of liquor or serum, the former being particularly favourable. Spindle spores are a characteristic of *T. purpureum* [*Sabouraudites ruber* or *T. rubrum*: ibid., xiii, p. 303] which differs from *T. coccineum*, however, in other respects; the former, moreover, mostly occurs on the smooth skin of adults, and the latter on children's hair. The organism under observation would appear to represent a transitional stage between the two species.

OLAH (D.). **Acrostalagmus cinnabarinus Corda isolato da un caso di tricofizia profonda.** [*Acrostalagmus cinnabarinus* Corda isolated from a case of deep trichophytosis.]—*Atti Ist. Bot. Univ. Pavia*, Ser. IV, v, pp. 121–124, 1934. [Latin and English summaries.]

From a tumour on the face of a male patient the author isolated a strain of *Acrostalagmus cinnabarinus* [*R.A.M.*, xi, p. 577], inoculations with which into laboratory animals gave negative results; he considers, however, that the fungus is pathogenic.

LEÃO (A. E. DE A.). **Sur une mycose osseuse par Acremoniella. Nouvelle espèce de champignon trouvée chez l'homme: Acremoniella rugulosa n. sp.** [On a bone mycosis caused by *Acremoniella*. A new species of fungus found on man: *Acremoniella rugulosa* n. sp.]—*Comptes rendus Soc. de Biol.*, cxvi, 26, pp. 1158–1160, 1934.

Acremoniella rugulosa n. sp. was isolated from the fibula of a 16-year-old Brazilian boy. The fungus grew well on Sabouraud's and other standard media, forming white (later darkening) raised colonies, rapidly coagulating milk, and slowly liquefying gelatine. It is characterized by hyaline or yellowish, septate, rugulose hyphae, 4 μ in diameter; straight, hyaline or dark, rugulose conidiophores, 20 by 2 to 4 μ; and spherical or elliptical, yellowish (ultimately black), rugulose conidia, 6 to 12 μ in diameter, borne singly at the apex of the conidiophore. The new species differs from *A. perinii* and *A. verrucosa*, both reported from Italy, in the structure of the conidiophores and in conidial dimensions.

LEÃO (A. E. DE A.), DA SILVA (J. O.), & PROENÇA (M.). **Sur un cas de sporotrichose à Sporotrichum beurmanni, observé pour la première fois chez un mulet à Rio de Janeiro.** [On

a case of sporotrichosis due to *Sporotrichum beurmanni*, observed for the first time in a mule at Rio de Janeiro.]—*Comptes rendus Soc. de Biol.*, cxvi, 26, pp. 1157–1158, 1934.

Sporotrichum beurmanni [*R.A.M.*, xii, p. 23] was found to be responsible for lesions on a mule at Rio de Janeiro, the present being the first record of the fungus on this animal in South America. The fungus grew well at 25° to 30° C. on Sabouraud's glucose and maltose agars, and on potato and carrot with glycerine, forming chocolate-coloured (black on potato), radiating colonies. Rats were readily infected by pure cultures of the organism.

GITMAN (L.) & BOYTCHENKO (E.). Справочник по болезням новых лубяных культур. [A manual of the diseases of the new bast-fibre plants.]—124 pp., 86 figs., New Bast Fibres Res. Inst., Moscow, 1934.

The feature of main interest in this small book is a list, arranged by the hosts, of all the fungi which have been recorded both in Russia and abroad on the various organs of the fibre-yielding plants recently introduced into Russia, namely, *Abutilon* spp., *Apocynum venetum* and *A.* spp., *Asclepias* spp., *Boehmeria* spp., *Cannabis sativa*, and *Hibiscus cannabinus* [*R.A.M.*, xiii, p. 372], as well as those found on *Dipsacus fullonum* and other species of this genus. The list gives some microscopical details of the fungi, with a bibliography of papers in which they are more fully described and, in the case of those organisms which have been recorded in Russia, a brief description of the macroscopical symptoms caused by them. The list is preceded by some general considerations on the diseases of the hosts so far observed in Russia.

SARTORY (A.), SARTORY (R.), MEYER (J.), & BÄUMLI (H.). **Reproduction expérimentale de maladies cryptogamiques du papier.** [The experimental reproduction of fungous diseases of paper.] —*Comptes rendus Acad. des Sciences*, cxcix, 3, pp. 222–224, 1934.

Two groups of fungi attacking cellulose were differentiated by the writers on the basis of inoculation experiments on clean paper tyndallized in Roux and Borrel tubes at 100° C. and subsequently held at 27°, namely, (1) *Aspergillus* sp., *Fusarium* sp., and *Cladosporium herbarum* var. *cellulosae*, which produce endoferments; and (2) *Actinomyces* sp. and *Monilia* sp., forming exoferments. The fungi of the first group produce a conspicuous discoloration varying with their different pigments, whereas those of the second cause a gradual disintegration of the fibres and perforation of the paper, a process requiring a period of up to two years to accomplish. The following were the times (*a*) of commencement, and (*b*) of cessation of cellulolysis observed: *Aspergillus* (*a*) 8th to 12th day, (*b*) 40th to 45th; *Fusarium* (*a*) 30th to 36th, (*b*) 48th to 50th; *Cladosporium* (*a*) 5th to 8th, (*b*) 40th to 45th; *Actinomyces* and *Monilia* (*a*) 3rd to 4th, (*b*) still proceeding after 50th.

ARONESCU (ALICE). **Diplocarpon rosae; from spore germination to haustorium formation.**—*Bull. Torrey Bot. Club*, lxi, 6, pp. 291–329, 5 pl., 1 fig., 1934.

This is a detailed and fully illustrated account of the author's investigation under controlled conditions of the early stages of infection of young rose leaves by *Diplocarpon rosae* [*R.A.M.*, xii, p. 696]. Under optimum environmental conditions (a saturated atmosphere and a mean temperature of about 75° to 80° F.) the spores complete germination on the leaf surface and form appressoria (not invariably produced) in about nine hours. An infection peg then penetrates the cuticle mechanically and enlarges into a sub-cuticular infection hypha. This passes down between the epidermal cells. Fine club-shaped haustoria are formed in the epidermal cells. In about 48 hours from inoculation hyphal strands develop subcuticularly. Browning of the host cells may start during the very early stages of invasion, and is chiefly responsible for the dark colour of the leaf spots which, under the conditions of the tests, usually appeared on the third day from inoculation. Further hyphal growth develops from the parallel strands about the sixth day, the main purpose of which is to find new places for penetration and formation of haustoria in cells not previously penetrated. These hyphae sometimes reach as far as the lower layers of the outer wall of the epidermis, but they do not penetrate into the lumen except by haustoria. Intracellular hyphae only appear at a late stage after the cells have been killed.

The work indicated that petioles and young rose stems may also be infected, and that the infection of all organs is very little influenced by the absence of light. The impervious cross wall laid down by the infection hypha by the thirteenth hour from inoculation may be the means by which the fungus is protected against drying out, so as to ensure its invasion regardless of weather conditions. In the author's view, *D. rosae* seems to represent a transitional and still rather weak stage of adaptation to parasitic life.

PETHYBRIDGE (G. H.). **Snapdragon (Antirrhinum) rust.**—*Journ. Min. Agric.*, xli, 4, pp. 336–340, 1934.

By June, 1934, snapdragon [*Antirrhinum majus*] rust [*Puccinia antirrhini*: *R.A.M.*, xiii, p. 704], first reported in England in 1933, though evidence is cited to show that it was almost certainly present several years before, had appeared in 15 southern and south-eastern counties, some of the attacks being almost devastating in their severity. Seedlings of ten different varieties of *Antirrhinum* grown (under conditions precluding outside infection) at Harpenden from rusted plants remained unaffected.

TIDDENS (BERBER A.). **Ueber die Wurzelfäule der Primula obconica, verursacht durch Thielaviopsis basicola Ferraris.** [On the root rot of *Primula obconica* caused by *Thielaviopsis basicola*.]—*Phytopath. Zeitschr.*, vii, 3, pp. 223–229, 3 figs., 1 graph, 1934.

This is a condensed account of the writer's studies on the root rot of *Primula obconica* caused by *Thielaviopsis basicola* in Holland,

a notice of which from another source has already appeared [*R.A.M.*, xii, p. 513].

BROWN (NELLIE A.). **A gall similar to crown gall, produced on Gypsophila by a new bacterium.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1099–1112, 4 pl., 1934.

This is a full morphological and cultural account of the causal organism of the soft, nodular gall on *Gypsophila paniculata*, a brief description of which has already been noticed [*R.A.M.*, xii, p. 224]. The organism is considered to be new to science and is named *Bacterium gypsophilae*, with a technical description. It is a motile, capsulate, non-sporiferous, Gram-negative, non-acid-fast, facultative aerobic rod, 0·4 to 1·2 by 0·2 to 0·8 μ in diameter, with several bipolar flagella, forming circular, smooth or rough, yellow, butyrous colonies on beef-infusion agar; it slowly liquefies gelatine but not blood serum, coagulates milk, and reduces litmus in 9 to 12 days; it produces ammonia and a trace of hydrogen sulphide, but no indol, and has no diastatic action; acid without gas is produced with saccharose, dextrose, maltose, mannite, but not lactose. Its temperature range for growth is from 5° to 40° C. with an optimum at over 30°; the thermal death point is between 52° and 53°. It grows at P_H values ranging from 5·1 to 9, with an optimum between 6·5 and 6·7. In beef bouillon and sterile milk the bacterium survived for eight months at 22° to 28° and for over 11 months at 14°, but on cover glasses it only withstood four days' drying. In a table these characters are compared with those of *Bact. beticola* [loc. cit.].

Galls were produced by inoculation on the related plants *Lychnis chalcedonica*, *Dianthus plumarius*, *Silene armeria*, and *Saponaria paniculata*. Well-defined swellings but no galls developed on inoculated potato stems, while no result followed the inoculation of several common hosts of *Bact. tumefaciens*.

The paper terminates with a brief survey of the conditions which appear to govern the occurrence of the disease in nature, and with a few suggestions for its control.

MCWHORTER (F. P.) & REYNOLDS (H. J.). **New Narcissus Botrytis disease in the Pacific Northwest.**—*Plant Disease Reporter*, xviii, 5, pp. 51–52, 1934. [Mimeographed.]

In a restricted area of King County, Washington, Laurens Koster and Glory of Sassenheim *Narcissus* plantings covering over 200 acres were destructively attacked in April, 1934, by a species of *Botrytis* apparently identical with that described by Dowson as *B. polyblastis* [*R.A.M.*, viii, p. 41]. Inoculations with pure cultures of the fungus from the large, chocolate-coloured, yellow-bordered lesions on the foliage showed that a period of only five days is required for the invasion and disintegration of thick stems. The disease spread eight miles in four days.

LORENZ (H.). **Stagonospora crini an Hippeastrum (Amaryllis).** [*Stagonospora crini* on *Hippeastrum* (*Amaryllis*).]—*Gartenflora*, lxxxiii, 7, p. 188, 1934.

Stagonospora crini spread from infected corms of *Amaryllis*

[*Sprekelia*] *formosissima* and *Sternbergia lutea* [*S. citrina*] to adjacent plants of *Hippeastrum* hybr. (*A. vittata*) [*R.A.M.*, x, p. 189]. When planted out in a cold frame the leaves and corms of the two-year-old seedlings developed elliptical, cinnamon-red lesions which assumed a verrucose form and caused the rupture of the epidermis. The most severe injuries occurred at the leaf insertions and necks of the corms. The conidia of the fungus are disseminated by sprinkling water and snails. Control can only be effected by keeping the hot-beds dry.

WHITE (R. P.) & MCCULLOCH (LUCIA). **A bacterial disease of Hedera helix.**—*Journ. Agric. Res.*, xlviii, 9, pp. 807–815, 2 pl., 1934.

A brief account is given of a bacterial leaf spot and stem canker of ivy (*Hedera helix*) which was first observed in the United States in 1930 in a consignment received in New Jersey from Maryland, and was also reported in 1932 by Burkholder and Guterman and attributed by them to *Phytomonas hederae* [*R.A.M.*, xii, p. 97]. The authors agree that in its symptoms the disease is identical with that described in 1920 from France by Arnaud (*Comptes rendus Acad. des Sciences*, clxxi, pp. 121–122, 1920), who named the causal organism *Bacterium hederae*, and previously in Germany by Lindau (*Zeitschr. f. Pflanzenkr.*, iv, p. 1, 1894). Arnaud's name is retained by them, although he failed to describe his organism or to report pathogenicity trials with it, the latter being, however, successfully done by Killian in 1921 (*Comptes rendus Soc. de Biol.*, lxxxiv, p. 224). Details are briefly given of inoculation experiments which showed that the bacterium is pathogenic to 12 horticultural varieties of the ivy, entrance by it into the host tissues being evidently gained through the stomata. The morphological, cultural, and physiological characters of *Bact. hederae* are fully described, and a technical diagnosis in English is appended; the index number (Soc. of American Bacteriologists) is 5322-3115-1222.

The organism was always isolated in pure culture from young diseased areas on the ivy, but isolations from old spots also yielded ten species of associated bacteria, one of which (of unestablished identity) was shown to have a synergistic action on *Bact. hederae*, whereas the nine other species had an anergistic action.

The paper terminates with some suggestions for the possible control of the disease.

YARWOOD (C. E.). **The comparative behaviour of four Clover-leaf parasites on excised leaves.**—*Phytopath.*, xxiv, 7, pp. 797–806, 3 figs., 1934.

Methods for the culture of four parasitic fungi on excised red clover (*Trifolium pratense*) leaves, viz., *Uromyces fallens* [*R.A.M.*, viii, p. 176], *Erysiphe polygoni* [ibid., xiii, p. 460], *Macrosporium* [or *Thyrospora*] *sarcinaeforme* [ibid., xiii, pp. 14, 327, 520], and *Colletotrichum trifolii* [ibid., xiii, p. 382], are described and discussed.

Leaflets maintained in a vigorous state by floating on 10 per

cent. sucrose solution were more susceptible to the two first-named fungi and less so to the two last than those floated on 2 per cent. sucrose or on water. Leaflets removed from the plant in the late afternoon were more vigorous, and showed greater susceptibility to *U. fallens* and *E. polygoni* and less to *M. sarcinaeforme* and *C. trifolii* than those cut in the early morning. Young excised leaflets were more vigorous, more susceptible to *E. polygoni*, and less so to *M. sarcinaeforme* and *C. trifolii* than older ones.

Excised clover leaflets artificially infected with *E. polygoni* were found very convenient for culturing *Cicinnobolus cesatii* [ibid., xi, p. 377].

JONES (F. R.). **Testing Alfalfa for resistance to bacterial wilt.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1085–1098, 1934.

Brief details are given of three years' experiments at Madison, Wisconsin, in which the author tried various methods for testing in one year the resistance of lucerne varieties to bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*], the results of which showed that his previously described method [*R.A.M.*, ix, p. 788] best combines convenience and efficacy. While the investigation again confirmed the supremacy in resistance of the Turkestan and Ladak varieties [cf. also ibid., xiii, p. 582] among the varieties tested so far, highly resistant plants have occasionally been found in the progeny of the latter, and subsequent tests of these showed that they might be either immune, highly resistant, or resistant.

Experiments to elucidate the nature of this resistance indicated that it is apparently largely exhibited by the parenchymatous tissues, through which, in resistant plants, the bacteria make little or no progress and so fail to reach the phloem or xylem, but it is also dependent to a certain extent on the fact that the bacteria multiply somewhat less rapidly in the vessels of the resistant plants. There was no evidence of morphological differences between resistant and susceptible plants as reported by Peltier and Schroeder [ibid., xii, p. 221]. Finally, the work showed an increase in resistance in open-pollinated progeny from some of the plants selected for resistance.

RICHARDS (B. L.). **Reaction of Alfalfa varieties to stem blight.**—*Phytopath.*, xxiv, 7, pp. 824–826, 1 diag., 1934.

In 1933 a series of experiments was carried out at Logan, Utah, to determine the relative susceptibility to stem blight of a number of American and foreign lucerne varieties. The disease is generally referred, on Sackett's authority (*Colorado Agric. Exper. Stat. Bull.* 159, 1910) to *Pseudomonas* [*Bacterium*] *medicaginis* [*R.A.M.*, xii, p. 177], but the writer has consistently isolated a species of *Phoma* from infected material [cf. ibid., xiii, p. 32]. Ladak (South Dakota) proved extremely resistant, with a susceptibility coefficient of only 0·15 per cent., closely followed by Hardigan 18999 (0·21) and Grimm Lat. (0·37), while other varieties showing under 1 per cent. infection included Hardigan Idaho, Grimm Idaho, Cossack 10643, Grimm Utah, and Sask. 666. The highest degree of susceptibility was manifested by French 18829 (2·20 per cent.), followed

by Russian 19305 (2·15), Russian 80909, Turkestan 19316, and French 19275 (all 2·10).

BIRD (J. N.). **Influence of rust injury on the vigour and yield of Timothy.**—*Scient. Agric.*, xiv, 10, pp. 550–559, 1 fig., 2 graphs, 1934. [French summary.]

This is a brief, tabulated account of the results of observations in 1933 of the effect on the vigour and yield of the host of a severe natural outbreak of rust (*Puccinia graminis phlei-pratensis*) [*R.A.M.*, xi, p. 628] during the late summer of 1932 in a plantation of 116 American and European timothy [*Phleum pratense*] strains, at Macdonald College, Quebec. The great majority of improved strains (including Gloria from Sweden and Ødtofte from Denmark) tested showed marked resistance to the rust, and gave a clear-cut demonstration of the importance of careful selection for rust resistance. No strains, however, were found to be entirely immune. Not only did the strains vary widely in their reaction, as measured by the vigour and yield of the plants in 1933, but the reaction of individual plants within the same strain also showed considerable variation. In a large proportion of the strains there was a regular gradation of rust injury from no apparent trace of the disease to almost complete killing. For these increasing grades of rust injury (represented by degrees from 0 to 5) the average green yields for 28 of the strains were 18·4, 15·3, 7·4, 4·7, 2·2, and 0·9 oz. respectively, and for the common 'check' strain 17·7, 13·9, 8·0, 4·6, 2·5, and 1·7 oz., respectively. A comparison of the variance in yield per plant for these 28 strains, between and within the grades of rust injury, indicated the statistical significance of rust injury as a factor influencing the yield of timothy.

YU (T. F.). **Notes on the storage and market diseases of fruits. I.**—*Contrib. Plant Path. Lab., Bot. Dept., Univ. of Nanking*, 25, 12 pp., 12 figs. [? 1934. Chinese summary.]

An annotated list, based on work carried out since 1932, is given of 27 fungi associated with rotted fruits in storage and on the market in China, of which the following may be mentioned. Stem-end rot of oranges (*Diplodia natalensis*) [see above, p. 763] appears to be widely distributed, the same host being also extensively infected in fruit from the Chekiang province by *Alternaria citri* [*R.A.M.*, xii, p. 215]. Black spot (*Phoma citricarpa*) [ibid., xiii, p. 219] is another common disease of oranges, but causes little market wastage. *Trichoderma lignorum* [ibid., ix, p. 106] was occasionally found rotting market oranges. Pears (*Pyrus ussuriensis* Maxim.) are liable to rotting by *A. gaisen* Nagano [published without diagnosis but stated by Tanaka to be identical with his *A. kikuchiana*: ibid., xii, p. 768]. Foreign pears (*P. communis*) at Nanking were attacked in a destructive form by *Macrophoma* sp., which causes a canker of the trunk and twigs. It was observed on Bartlett and Kieffer pears in the University garden. In storage it produces small, brown to black spots which are sometimes concentrically zoned. Dry rot of pomegranates (*Punica granatum*) caused by *Zythia versoniana* [ibid., xii, p. 641] is an important field and storage disease.

MAY (E.). **Was kosten die Sommerspritzungen?** [What do summer sprays cost?]—*Die Kranke Pflanze*, xi, 7–8, pp. 88–90, 1934.

Some figures are given of the costs of summer spraying against fruit diseases and pests in Germany. Hercynia-neutral [*R.A.M.*, xii, pp. 32, 297] is used at the rate of 300 gm. per 100 l. water, so that the cost of 100 l. of mixture, reckoning M. 2·50 as the price per kg., is Pf. 75, which may be reduced to Pf. 66 when purchased in bulk. The price of 1·5 kg. of nosprasit '0' [ibid., xii, pp. 233, 745, *et passim*] is M. 3·05, so that the cost of 100 l. of mixture amounts to rather more than M. 1. The advantages of a mixture of lime-sulphur and lead arsenate for use on the foliage of apple varieties liable to scorching from copper sprays is stressed. The superior brands of lead arsenate, viz., Borchers, blarsenat, urania [ibid., xi, p. 169], and zabulon are all the same price (M. 1·80 per kg.), working out at Pf. 72 for the requisite quantity of 400 gm. per 100 l.; with the addition of 2 l. lime-sulphur at M. 4 per 10 l. the total cost of 100 l. of the mixture is M. 1·52.

ARK (P. A.). **Dissociation in Erwinia amylovora (Burrill) Comm. S.A.B.**—*Science*, N.S., lxxx, 2062, p. 20, 1934.

The 'rough' type of colony was obtained in *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xiii, p. 707] by growing the 'smooth' form in common nutrient broth at P_H 6·9 for 20 days at 12° to 25° C., and also by daily transference at 18-hour intervals into bouillon at P_H 6·9 and incubating at 28°. The rough colonies were large, flat, wrinkled, and dull, forming clumps on suspension in 0·85 per cent. sodium chloride solution. The individual bacteria were only moderately motile in comparison with those of the smooth colonies; their pathogenicity to pear was slight and they were innocuous to certain shrubs liable to severe damage from the smooth type. Rough and intermediate types were isolated from old natural apple, pear, and shrub infections. The reversion of rough to smooth took place in 2 per cent. sucrose or 1 per cent. dextrose bouillon after four to six transfers, the organism being attenuated, on the other hand, by sucrose concentrations of 10 per cent. or above.

HILDEBRAND (E. M.). **Life history of the hairy-root organism in relation to its pathogenesis on nursery Apple trees.**—*Journ. Agric. Res.*, xlviii, 10, pp. 857–885, 3 figs., 2 graphs, 1934.

After a brief description of isolation and inoculation experiments, the results of which confirmed the differentiation of the apple hairy root organism (*Phytomonas* [*Bacterium*] *rhizogenes*) from *Bact. tumefaciens* [*R.A.M.*, x, p. 166; xiii, p. 521], the author gives a detailed account of his studies of the life-history of the former in relation to its pathogenicity on nursery apple trees, and on certain other plants in the greenhouse, including Paris daisy [*Chrysanthemum frutescens*], bean, sugar beet, and *Sedum spectabile*. The results showed that *Bact. rhizogenes* gains entry into the host tissues exclusively through wounds, the nature of which

did not appear to influence much the kind of overgrowth produced, but did have a certain bearing on the length of the incubation period, the percentage of successful infections, and the extent of the reaction; very shallow wounds proved to be poor infection courts. The time during which wounds on the underground stems of nursery apple trees remained liable to infection was found to average about two days, callus tissue usually forming a barrier against invasion by the organism.

Field observations, supported by a special series of experiments, suggested a close relationship of insects to hairy root infection. Root-eating insects, especially white grubs (*Phyllophaga*) and wireworms (Elateridae) were frequently found feeding on healthy and hairy root tissue, and the causal bacteria were isolated from the white grubs, though not from the other species. In preliminary trials the amount of hairy root infection was considerably reduced by the application of insect repellents or insect barriers. The time of the season, as well as the age and size of the nursery trees in Kansas, where the trees are grown for only two years in the nursery, did not seem to influence susceptibility to infection either in nature or under controlled conditions. Varietal susceptibility varied widely, ranging from 12 to 100 per cent. in the 29 varieties of apples tested in 1930, and from 22 to 100 in the 37 varieties tried in 1931. Previous infection did not appear to immunize the trees against subsequent attack.

Histological studies appeared to indicate that *Bact. rhizogenes* developed in the liquid exuded from the wounds, the bacteria then becoming located in the intercellular spaces (both in Paris daisy and apple stems), where their presence stimulated the formation of somewhat circular areas of hyperplasia. The bacteria were found to be abundant on the surface of the hairy root enlargements, and were isolated from the surface and subsurface parenchymatous tissues of these swellings; they were also found frequently in the soil near by. The longevity of the bacteria in steamed or untreated field soil exceeded one year. There was also evidence that the bacteria may be disseminated by shipments of nursery stocks, and surface washings from seedling roots yielded the organism.

RIKER (A. J.) & HILDEBRAND (E. M.). **Seasonal development of hairy root, crown gall, and wound overgrowth on Apple trees in the nursery.**—*Journ. Agric. Res.*, xlviii, 10, pp. 887–912, 3 figs., 5 graphs, 1934.

This is a detailed account of the authors' study during the widely different growing seasons of 1929, 1930, and 1931 in Kansas of the seasonal development of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) and hairy root (*P.* [*Bact.*] *rhizogenes*) [see preceding and next abstracts], induced by inoculations with single-cell cultures of the causal organisms, and of wound overgrowths induced by wire girdles or knife cuts on apple (Yellow Transparent) nursery trees. A brief description is given of the successive stages in the development of these several proliferations to assist in their differential diagnosis. The incubation periods of crown

gall and hairy root were relatively long in the spring and autumn, and relatively short during the summer, suggesting a correlation with temperature and with active growth of the trees. Both conditions developed in piece-root grafted trees which were inoculated at grafting time, and adhesive tape wrapped around the unions only slightly delayed the appearance of the symptoms but did not reduce the number of successful infections. In uninoculated grafts adhesive tape wrappers prevented the entrance of the bacteria from the soil so long as they remained intact.

Under conditions of natural infection, various mixtures of the three types of outgrowths occurred, especially on second year trees, crown gall being of minor importance. A relatively small amount of hairy root infection occurred at grafting time, but it is believed to have been important as a source of inoculum for subsequent infections, which often increased in number with the age of the planting. It is pointed out that the studies were made in a place where infectious hairy root is prevalent, and consequently deal with severe rather than with average conditions.

RIKER (A. J.), KEITT (G. W.), HILDEBRAND (E. M.), & BANFIELD (W. M.). **Hairy root, crown gall, and other malformations at the unions of piece-root-grafted Apple trees and their control.**—*Journ. Agric. Res.*, xlviii, 10, pp. 913–939, 2 diags., 1934.

This is a summarized account of studies which were made during several years in seven of the mid-western United States for the purpose of finding a means of reducing the severe losses caused by crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), infectious hairy root (*P.* [*Bact.*] *rhizogenes*), and various types of wound overgrowths [see preceding abstracts], in apple nurseries where for reasons of economy preference is still given to piece-root grafting over budding. Observations in the nurseries showed the occurrence of various kinds and degrees of mixtures of these different categories of proliferations, most of which appeared at or near the graft union, crown gall being apparently of minor importance. There often appeared to be a direct correlation between the length of time the trees remained in the nursery row and the percentage of overgrowths. In some districts wound overgrowths frequently became infected subsequently with *Bact. rhizogenes*. In some cases the development of hairy root was traced to infection of the seedling roots at grafting time, especially when such roots were grafted in a moist and dirty condition, but in others this factor appeared to be of relatively little importance. Experiments showed that trees with infectious hairy root usually made slightly less growth than the controls, although the abnormally developed roots were shown to be able to keep the trees alive for at least one season after the removal of all the other healthy roots.

The use of stocks grown from the seed of relatively resistant apple varieties gave promise of being a factor of some importance in the control of the graft proliferations, and a measure of control appeared also to be afforded by antiseptic treatment of seedlings carrying the pathogenic bacteria. Adhesive tape wrappings

around the grafts [loc. cit.] appeared to give better protection than any other of the wrappings tested against the entry of the bacteria from the soil (although they did not prevent infection at the time of grafting), and to be the most important single factor among control measures. Planting in soil treated so as to render it relatively free from root-eating insects is also recommended as a measure tending to minimize the incidence of the different overgrowths.

GOODWIN (W.), MARTIN (H.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1933.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 136–144, 1934.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xiii, p. 104] conducted in Kent in 1933, Allington Pippin and Newton Wonder trees received two pre- and two post-blossom applications either of home-made Bordeaux mixture (8:12:100) or of an emulsion prepared by adding simultaneously 6 pints of cotton-seed oil (to give a concentration of 0·75 per cent.) and 4 galls. of 10 per cent. copper sulphate solution to 95 galls. of water containing 6 lb. of hydrated lime. The oil emulsified readily without forming the green scum observed with the mustard oil wash previously used [loc. cit.].

The results obtained [which are tabulated and fully discussed] showed that in the unsprayed Allington Pippin control plots the scab-free apples averaged 19·2 per cent. of the crop, the corresponding figures for the plots sprayed with Bordeaux mixture and the emulsion being 92·2 and 92·8 per cent. In the Newton Wonder control plots the scab-free apples averaged 7·6 per cent. of the crop, the corresponding figures for the plots treated with Bordeaux mixture and the emulsion being 60·9 and 64·4 per cent.

The Allington Pippin trees sprayed with Bordeaux mixture showed 9·15 per cent. of the total crop and 9·92 per cent. of the grade I apples russeted, the corresponding figures for the trees sprayed with the emulsion being 4·85 and 4·93 per cent.; with the Newton Wonder trees the figures were, respectively, 2·93 and 3·81 per cent. for the Bordeaux mixture, and 0·70 and 0·95 per cent. for the emulsion.

Estimations of the amount of copper retained expressed as milligrams of metallic copper per sq. m. of leaf surface showed that the spray deposits given by the Bordeaux mixture and the emulsion were comparable in copper content; in fact, the amounts of copper retained on the foliage sprayed with the emulsion were greater after one or two months than those retained on the foliage sprayed with Bordeaux mixture.

The cotton-seed oil-Bordeaux mixture is considered to deserve trial on an extended commercial scale as it is as fungicidal as Bordeaux mixture, causes less russeting, and can be applied speedily as a heavy wash in which insecticides can be incorporated.

The constantly heavier infection noted on the Newton Wonder trees each year in the tests suggests that a specialized form of the fungus may attack this variety [cf. ibid., x, p. 464; xi, pp. 48, 461].

CROWELL (I. H.). **The hosts, life history, and control of the Cedar-Apple rust fungus Gymnosporangium juniperi-virginianae Schw.**—*Journ. Arnold Arboretum*, xv, 3, pp. 163–232, 8 pl., 2 maps, 1934.

A comprehensive, fully tabulated account is given of the writer's inoculation experiments at the Arnold Arboretum of Harvard University on 108 species of 11 related genera of Rosaceae with *Gymnosporangium juniperi-virginianae* from Massachusetts [*R.A.M.*, xiii, p. 383].

All the 16 species and varieties of the section *Chloromeles* of the genus *Malus* [*Pyrus*], together with *M.* [*P.*] *fusca* and *M. sylvestris* [*P. malus*], produced aecidia as a result of inoculation with the teleutospores of the rust. Twelve species and varieties belonging to other sections of the genus produced spermogonia only, while the remaining 47 species and varieties of *Malus* and all others tested or observed were found to be immune. An examination of the genus *Juniperus* in the Arboretum showed that *J. virginiana* and twelve varieties, *J. scopulorum*, and *J. horizontalis* (each with two varieties) are susceptible to *G. juniperi-virginianae*, the remaining 52 species and varieties being immune.

A peculiar phenomenon associated with infection by *G. juniperi-virginianae*, apparently only in certain wild apples, such as *P. ioensis plena* and *P. soulardi*, is the forced growth of buds, of which this is believed to be the first description. The infected buds became much swollen and commenced growth. The diseased twigs increased greatly in diameter but very little in length, while the leaves expanded irregularly and were uniformly thickened, pale green, and tomentose. The spermogonia, followed by aecidia, first appeared at the pedicel bases, whence they spread to the petioles and leaves.

The results of an analysis of teleutospore material from eight States indicated the existence of biologic strains.

A number of constitutional and environmental factors are discussed in relation to their influence on the reaction both of apples and red cedars to *G. juniperi-virginianae*. As regards control of the disease, it appears that the cedar eradication law in all of the north-eastern States is no longer generally enforced, and in the light of present information on resistance and susceptibility it may be possible to maintain satisfactory stands of orchards and ornamental apples without sacrificing the alternate host. Four to five applications of Linco colloidal sulphur (0·5 per cent.) gave promising results in the control of the rust on apples under experimental conditions.

BAKER (K. F.) & HEALD (F. D.). **An investigation of factors affecting the incidence of lenticel infection of Apples by Penicillium expansum.**—*Washington Agric. Exper. Stat. Bull.* 298 (*Tech. Paper*), 48 pp., 1934.

This is a fully tabulated account of the authors' field and laboratory experiments in 1930–4 in Washington State to determine the chief factors affecting lenticel infections of apples with blue mould (*Penicillium expansum*) [*R.A.M.*, xii, p. 226]. In the Yakima and

Wenatchee valleys some of the ranches supply apples severely affected with the trouble every year, while in others the losses are occasional. Infection is governed by the following main factors in decreasing order of importance: (1) susceptibility of the lenticels to invasion by *P. expansum*; (2) density of spore load on the surface of the fruit; and (3) conditions influencing the process of infection. Of these only the first two are believed to be limiting factors under commercial conditions.

The susceptibility of the lenticels to infection appeared to be conditioned by many factors, among which delayed picking, various types of bruises, and storage of the apples at 0° C. previous to washing in heated (43° to 49°) solutions [loc. cit.] increased susceptibility, while holding the fruit in the orchard (especially under dry conditions) prior to storage usually decreased it; treatment with dry heat decreased susceptibility in every case. H. F. Clements's unpublished method of immersing the apples in an aqueous solution of methylene blue for two or three days shows by the extent of the penetration and diffusion of the dye the degree to which the cavity of the lenticels is suberized or cutinized and thus protected against the advance of the fungus.

Of the four factors which may stimulate the germination of the spores on the surface of the fruit, namely, the volatile products of the apples, exosmosis of nutrients through the uncutinized lenticel cells, juice from adjacent decayed fruit, and the acidity of the moisture on the surface, the first alone is thought to be important under commercial conditions. A series of tests indicated, however, that besides stimulating spore germination, the tissue of decayed apples contains enzymes which by their action on the uncutinized cells of the lenticels facilitate the penetration of the latter by *P. expansum*, and thus increase the susceptibility of apples lying in direct contact with rotted fruit to lenticel infection.

On the whole, the investigation failed to disclose any single factor in the growers' control sufficient to account for the high percentage of blue mould decay frequently found in commercial lots, but as many of the conditions now known to predispose to lenticel infections as practicable should be avoided. Cold storage is valuable only inasmuch as it retards the development of the *P. expansum* rot; it does not, however, prevent either infection of the lenticels or mechanical injuries which are good infection courts when the fruit is returned to normal temperatures.

BAKER (K. F.) & HEALD (F. D.). **Investigations on methods of control of the blue-mold decay of Apples.**—*Washington Agric. Exper. Stat. Bull.* 304, 32 pp., 1934.

Further investigations [which are described, and the results of which are tabulated and discussed] conducted in Washington into the control of blue mould of apples (*Penicillium expansum*) [see preceding abstract] showed that contamination of the picking boxes and packing equipment [*R.A.M.*, xii, p. 295] increases greatly during harvest time and to a less extent from season to season; these articles should be sprayed with a sodium hypochlorite solution containing 0·4 per cent. available chlorine. Rinsing the apples for at least one minute in the same solution after washing

very effectively reduced infection on the surface of the fruit and in the lenticels [ibid., xi, p. 658], decreasing the decay also at punctures and other points of entry. The treatment was non-injurious, and the flavour and appearance of the fruit remained unimpaired.

The sterilization of storage rooms, bins, &c., with copper sulphate was not effective, and sodium bicarbonate, sodium tetraborate, and sodium carbonate were insufficiently fungicidal to *P. expansum* to be of use in the treatment of the fruit.

A bibliography of 38 titles is appended.

BANGA (O.). **Het 'steelrot' van Appels.** [The 'stalk rot' of Apples.]—*Tijdschr. over Plantenziekten*, xl, 7, pp. 157–169, 1 pl., 1934. [German summary.]

Undetermined species of *Phomopsis* [*R.A.M.*, xii, pp. 32, 573] and *Cylindrocarpon* [cf. ibid., x, p. 626] were isolated in the Betuwe district of Holland during the winter of 1932–3 from stored apples (Golden Pippins) affected by a rot beginning at the stalk and gradually involving the entire fruit. The infected tissues were completely permeated by hyphae. Inoculation tests showed that the fungi under observation are incapable of penetrating the skin of the fruit except through wounds. It was found that infection normally occurs through the stalk after the latter has dried up, and the hyphae then pass into the fruit so that the dried stalk comes to be inserted in the centre of the rotted basal area. Premature harvesting is believed to be an important factor in the etiology of this stalk rot, as the withering of the stalks of green apples was more rapid and more frequently followed by rotting than in apples harvested when mature or nearly mature.

HOCKEY (J. F.) & BOYLE (J. A.). **Gravensteins—time of picking in relation to spot scald.**—*Scient. Agric.*, xiv, 11, pp. 608–613, 2 figs., 1934. [French summary.]

When Banks Gravenstein apples picked at weekly intervals were placed in ventilated storage the least spot scald [*R.A.M.*, xii, p. 299] developed in the fruit gathered when most of the starch had disappeared from the core area but an appreciable amount remained in the flesh. The quantity of sucrose and total sugars present had practically no effect on the prevalence of the disease. Harvesting when most of the starch had disappeared from the core area gave larger, better coloured, better-keeping fruit than earlier picking. The iodine-potassium iodide test for starch [cf. ibid., viii, p. 252] was superior to a mechanical pressure tester for determining the picking maturity in apples ripening about the same time as Gravensteins.

MARTIN (H.), SALMON (E. S.), & WARE (W. M.). **Spraying experiments against Pear scab.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 145–154, 1 fig., 1934.

In a comparative spraying test carried out in Kent against scab [*Venturia pirina*: *R.A.M.*, xii, pp. 767, 774] Marguérite Marillat and Williams's Bon Chrétien pear trees were given one pre- and either two or three post-blossom applications of Bordeaux mixture

(8 : 12 : 100) or of an emulsion composed of 4 lb. copper sulphate, 6 lb. hydrated lime, and 6 pints Sudanese cotton-seed oil in 100 galls. water [see above, p. 779].

The two plots of the former variety receiving two post-blossom applications of Bordeaux mixture gave, respectively, 3·4 and 10·2 per cent. scabbed pears, as against 1·4 and 5·2 per cent. for those receiving three, while those receiving two post-blossom applications of the emulsion gave 6·7 and 3·8 per cent. scabbed fruits, respectively, as against 1·7 and 2·8 per cent. for those receiving three; the unsprayed control plot had 79·4 per cent. scabbed fruits. The corresponding figures for the Bon Chrétien trees were 49·1, 38·1, 8·8, and 15·1 per cent. for the Bordeaux mixture and 46·2, 14·8, 5·7, and 13·2 per cent. for the emulsion, as against 79·2 per cent. for the unsprayed controls.

The improvement in scab control resulting from three post-blossom applications as compared with two was statistically significant and was greater on Bon Chrétien than on Marguérite Marillat. The Bordeaux emulsion was as effective a fungicide as the plain Bordeaux mixture.

No appreciable russeting was caused on Bon Chrétien fruits by either spray, but the Bordeaux mixture produced slight roughness of the skin on Marguérite Marillat fruits. Both sprays caused some damage to the foliage of the latter variety and to that of Doyenné du Comice.

The conidial (*Fusicladium*) stage was found, often in abundance, on the young wood and spurs of Louise Bonne and Doyenné du Comice pears and on the young wood, spurs, and on one bud-scale of Bon Chrétien.

CURZI (M.). **Una grava infezione da 'Phytophthora' dei Peschi.** [A severe infection of Peaches by *Phytophthora*.]—*Rendic. R. Accad. Lincei*, xix, Ser. VI, 11, pp. 817–820, 1934.

Three-year-old peach trees growing in a siliceous clay soil near Rome were recently observed to show a wilting of the foliage accompanied by necrosis of the base of the stem, the soil around which was stained dark blue, probably as a result of the exudation of tannic substances from the injured cortex such as occurs in ink disease of chestnut and walnut (*Phytophthora cambivora*) [*R.A.M.*, xiii, p. 603]. The diseased cortex emitted a slightly acid, pungent odour and the underlying wood showed a brown discoloration extending slightly beyond the limits of the surface necrosis. The wood was invaded by secondary fungi, but towards the upper limiting zone of infection the actual agent of the disease was detected in the shape of two types of *Phytophthora*, designated α and β.

Type α formed neither sporangia nor oospores in any of the nutrient media used, but in water piriform sporangia, without a terminal papilla were produced, measuring 43 to 53 by 30 to 33 μ (42 to 45 by 20 to 25 μ on the surface). An affinity with *P. syringae* [ibid., xi, pp. 111, 579] appears to be indicated, but unlike that species, the peach pathogen develops at 23° to 25° C. and was found capable of attacking potato tubers. This was the type isolated from the majority of the infected trees, but one yielded quite

a different organism (β), characterized by profuse oospore formation in most media. These bodies are spherical, 25 to 43 μ in diameter (mostly 34 to 38 μ), with a smooth, hyaline or pale yellow wall, 2 to 3·75 μ in thickness. They are produced in spherical oogonia, 30 to 50 μ in diameter (40 to 46 μ), provided with paragynous, globose or piriform antheridia, measuring 13 to 17 by 10 to 14 μ. The sporangia (formed in water) are lemon-shaped, apiculate, and measure 32 to 75 by 12 to 30 μ (43 to 53 by 20 to 25 μ); they germinate readily by the emission of typical biciliate zoospores, 11 to 13 μ in diameter. The more frequently the water was changed, the more profuse was sporangial development in both these types of *Phytophthora*, a fact supporting the writer's belief that infection was spread by running water on the surface of the soil [cf. ibid., vi, p. 333]. Type β falls into the *cactorum* group [ibid., xiii, pp. 213, 585], differing from the Californian strain [ibid., xi, p. 339], however, in its abundant oospore development on nutrient media, its failure to form sporangia on such substrata, and its somewhat larger oogonia and oospores.

The writer believes that the *Phytophthora* disease of peaches is serious and common in Italy, where it has hitherto been confused with other infectious troubles or attributed to adverse climatic conditions. The fungus gains entry to the tissues during the dormant period from October to the spring, stagnant moisture at the base of the tree being favourable to infection. Good results have been given by decortication and the application of 3 to 5 per cent. Bordeaux mixture to the stems, root collar, and surrounding soil.

HOWELLS (D. V.). **Strawberry culture. II.**—*Scottish Journ. of Agric.*, xvii, 3, pp. 287–293, 1934.

The strawberry varieties principally affected by the red core or Lanarkshire disease (*Phytophthora* sp.) [allied to *P. cinnamomi*: *R.A.M.*, xiii, p. 76] in April and May are those with luxuriant foliage, such as Royal Sovereign, Oberschlesien, and Ruskin. A partial revival of growth after the middle of June is liable to create a false impression of permanent recovery; a protracted wet spell in late July or August may be followed by extensive autumn spread of the disease and noticeable winter killing. Under field conditions the red core disease attains its maximum intensity from May to early June and from September to the middle of October, these periods coinciding with those of most profuse root formation. Young plants infected by the fungus frequently collapse much more rapidly than old ones, the requirements of which in food and water are less exacting. In a given strain of plants the disease appears to be cumulative, increasing in severity in each generation of runners taken, so that ultimately total failure occurs even in maiden plantations. It is obvious, therefore, that the chief means of control lies in the avoidance of diseased stock for planting, supplemented by thorough field sanitation; eventually the situation may be saved by the development of immune varieties.

Yellow edge [ibid., xiii, pp. 563, 642] appears to have become fairly well established in Scottish strawberry plantations of recent

years. Most of the infections are stated to be traceable to imported English material.

TRUSCOTT (J. H. L.). **Fungous root rots of the Strawberry.**—*Canadian Journ. of Res.*, xi, 1, pp. 1–17, 4 pl., 1 fig., 1934.

Two years' investigations in Ontario showed that the primary parasites as established by successful inoculations [which are briefly described] associated with strawberry root rot [*R.A.M.*, xi, pp. 250, 251; xiii, pp. 173, 454] were of the following genera: *Pythium*, *Fusarium*, *Alternaria*, *Ramularia*, *Rhizoctonia*, *Verticillium*, and *Cylindrocladium*. Three additional forms found were *Asterocystis*, a Plasmodiophoraceous fungus apparently related to *Spongospora*, and the mycorrhizal Phycomycete with vesicles and arbuscles [ibid., iv, p. 301; vii, p. 524]. As a similar root flora was found in wild strawberry roots most of the organisms are probably indigenous.

A bibliography of 25 titles is appended.

HILDEBRAND (A. A.). **Recent observations on Strawberry root rot in the Niagara Peninsula.**—*Canadian Journ. of Res.*, xi, pp. 18–31, 2 pl., 1 fig., 1934.

Fungi of about 20 different genera were isolated in the Niagara Peninsula from 684 diseased strawberry roots [see preceding abstract], ranging in frequency of occurrence from 0·4 (*Gliocladium*) to 32·7 per cent. (*Fusarium*), the figures for *Ramularia* and *Pythium* being 28·5 and 10·8 per cent., respectively. Some of the species appeared to be restricted in their distribution while others, such as *Fusarium*, *Ramularia*, *Penicillium*, *Hainesia*, and *Coniothyrium*, were more widespread. Nine different genera were found on 125 apparently healthy rootlets on diseased roots, the frequency of occurrence ranging from 1·6 (*Alternaria*) to 4 (*Fusarium*) and 5·6 per cent. (*Ramularia*). Practically all of 550 roots of wild and cultivated strawberries showed two endotrophic mycorrhiza, sometimes together, much the commoner being of the phycomycetoid type, while the other was of the *Rhizoctonia* type [*R.A.M.*, xii, p. 312]. Resting spores of *Asterocystis* [ibid., iii, p. 539] and the spherical, smooth-walled spores of a member of the Plasmodiophoraceae were observed on diseased rootlets early in the season, and *Pythium* was abundant on roots obtained in the field in September and November. In experiments in which a pair of runners from 75 plants were trained, one into sterilized soil and the other into soil naturally infested with root rot, the runners being quite healthy at the beginning of the experiment, the former set yielded healthy vigorous plants and the latter degenerated, stunted ones with more or less diseased root systems. Stolons from the latter trained over sterilized soil produced healthy plants so that the 'degeneration' does not appear to pass along the stolon.

A bibliography of 13 titles is appended.

PLAKIDAS (A. G.). **Control of Strawberry leaf blights in Louisiana.**—*Louisiana Agric. Exper. Stat. Bull.* 252, 17 pp., 5 figs., 1934.

Most of the information given in this bulletin [which is a revision

of *Louisiana Agric. Exper. Stat. Bull.* 225] on strawberry leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*) and their control in Louisiana has already been noticed from other sources [*R.A.M.*, xii, p. 679 ; xiii, p. 712]. Applications of 4-4-50 Bordeaux mixture at ten-day intervals from January to early March gave almost complete control and neither injured the open blossoms nor interfered with pollination.

BANFIELD (W. M.). **Life history of the crown-gall organism in relation to its pathogenesis on the red Raspberry.**—*Journ. Agric. Res.*, xlviii, 9, pp. 761–787, 4 figs., 2 graphs, 1934.

This is a full account of the author's investigation, a preliminary report of which has already been noticed from another source [*R.A.M.*, vii, p. 430], of important points in the life-history of *Bacterium tumefaciens* in relation to its pathogenesis on the red raspberry (*Rubus strigosus*) in the United States [ibid., xiii, p. 685]. In addition to the information already given, it was definitely shown that under suitable moisture conditions the organism is continuously given off into the soil from the surface of living crown galls, and is able to exist in a pathogenic state for at least 14 months in unsterilized soil in the absence of plants under nursery conditions. It was further found that it may be carried from the nursery to new areas in the form of incipient infections on the raspberry, which cannot be detected by macroscopical inspection of the canes. In artificially inoculated soil, infection occurs exclusively through wounds (root-feeding arthropods causing most of the injuries in infections observed by the author), at a practically uniform rate throughout the growing season of the host, injuries on the underground parts of red raspberry remaining open to crown gall infection for a relatively long period, occasionally up to seven weeks. The incubation period on the underground parts was found to vary from 11 to more than 28 days according to environmental conditions, chiefly seasonal.

PLAKIDAS (A. G.). **The rosette disease of Blackberries and Dewberries.**—*Louisiana Agric. Exper. Stat. Bull.* 250, 8 pp., 2 figs., 1934.

Experiments conducted in Louisiana showed that blackberry and dewberry [*Rubus* spp.] rosette (*Cercosporella* sp.) [*R.A.M.*, xi, p. 727 ; xii, p. 680 ; xiii, p. 454] may be controlled by removing, preferably in February, any rosette growth present before the blossoms open, pruning the primary canes to the ground about the first week in May, and spraying the new canes that develop from the time of pruning until the first week in June with 4-4-50 Bordeaux mixture at intervals of about ten days ; two or three applications appear to be sufficient.

One of the chief symptoms is the characteristic alteration of the blossoms, which are elongated, with leafy calyx lobes and enlarged, pink petals that often fail to unfold. The stamens are arrested in growth and seldom mature their pollen ; at a later stage they and the pistils are covered with a whitish powdery growth of the mycelium and spores of the fungus. Infection results from spores reaching the young buds of the new season's canes, the germ-tubes

penetrating to the meristematic tissue of the buds. If a terminal bud is infected all new lateral shoots contain the mycelium, but the infection of a lateral bud does not spread beyond the shoot arising from it. The rosette symptoms first become visible a year later.

STAHEL (G.). **The Banana leaf disease in Surinam.**—*Trop. Agriculture*, xi, 6, pp. 138–142, 2 pl., 1934.

This is an account of a leaf spot which was first noticed in 1933 in several experimental fields of Congo bananas [*Musa sapientum*] in different localities of Surinam. The severity of the outbreaks in the Surinam and Commewijne districts, in the first of which the disease entirely suppressed the production of fruit suitable for the market, while in the second the size of the banana bunches was significantly reduced, appears seriously to imperil the prospects for the commercial cultivation of the Congo banana, the introduction of which into Surinam was attempted because of its immunity from the Panama disease [*Fusarium oxysporum cubense*: *R.A.M.*, xiii, p. 586]. At the time of writing, the disease is stated to have spread in a more or less serious degree to all the varieties of *Musa*, even *M. textilis*, cultivated in Surinam.

Of the fairly numerous fungi associated with the leaf spot, only two species, namely, *Helminthosporium torulosum* [ibid., xii, p. 552] and *Cordana* [*Scolecotrichum*] *musae* [ibid., xiii, pp. 251, 455] were shown in inoculation experiments to be able to penetrate the unwounded leaf tissues. *H. torulosum* was proved to be a vigorous parasite. Its conidia under moist conditions germinate in about an hour and the germ-tubes form large appressoria four to six hours later, which give infection hyphae that penetrate into the epidermal cells after about 12 hours. Entry through the stomata was not observed, even when an appressorium is formed over a stoma. After entry the infection tube swells and forms several large, globular cells which fill the epidermal cell. The neighbouring cells are then killed in advance of penetration, indicating the secretion by the fungus of toxic substances. The water cells are entered after their death, and a new globular cell is immediately formed close to the pierced wall; from this several hyphae are sent across the water cell to enter the underlying palisade cells, on emerging from which the fungus then spreads unimpeded through the intercellular spaces of the mesophyll. Experimental infections were also obtained on the Governor [*M. cavendishii*] banana leaves.

S. musae proved to be a less vigorous parasite. Its two-celled conidia almost always germinate from the proximal pointed cell on the side wall near the septum, by the production of a comparatively short germ-tube which in about eight hours forms an appressorium. The underlying epidermal cell is entered several hours later and one or more large, globular cells develop in its lumen, the whole process requiring the presence of a film of moisture on the leaf surface for at least 12 hours. The fungus was shown to be able readily to penetrate the unwounded epidermal wall of all the leaves up to the thirteenth on the living plant, but it was not able to kill the large water cells by toxic secretions, like

H. torulosum, and therefore failed to enter the inner tissues of the leaf.

WARDLAW (C. W.). **Banana diseases. VIII. Notes on various diseases occurring in Trinidad.**—*Trop. Agriculture*, xi, 6, pp. 143–149, 6 pl., 1934.

Continuing his notes on banana diseases in Trinidad [*R.A.M.*, xiii, p. 455], the author gives a brief account of a recent localized outbreak of bacterial wilt (*Bacterium solanacearum*), of interest mainly because under the conditions of growth in the locality the Gros Michel variety exhibited a high degree of susceptibility to natural infection [cf. ibid., xiii, p. 713]. Moko and another variety of plantain [*Musa paradisiaca*] were attacked in the same plantation. The bacterial wilt is readily distinguishable from Panama disease [*Fusarium oxysporum cubense*] by the presence of a bacterial exudation from the diseased vascular bundles, and the yellow or brown colour of the latter instead of the reddish or crimson one characteristic of Panama disease. The fruit bunches were yellowed and the pulp at first became soapy and then dried up and crumbled, accompanied by rupturing of the skin.

Another pathological condition induced by bacteria but quite distinct from that caused by *Bact. solanacearum* and also from the blood disease described in the Dutch East Indies [ibid., i, p. 225] was observed in Dwarf Cavendish [*M. cavendishii*] fruits. The diseased bananas tend to be slightly irregular in shape, angular, small, and sometimes prematurely ripened, with a yellowish-brown to dark crimson discoloration of the pulp, the progress of the pathogen in lighter infections being traceable as a number of separate yellowish-brown streaks, extending from the stylar end, where infection always starts, to a greater or lesser distance towards the base. The organism, the exact identity of which has not yet been established, multiplies chiefly in the intercellular spaces in the fruit.

A Gros Michel × *M. acuminata* seedling banana at the Imperial College of Tropical Agriculture was affected during the 1933–4 rainy season by a disease chiefly characterized in plants attacked prior to the appearance of the bunch by a severe tip rot of the young unfolded central leaf, accompanied by a pronounced blackening of the tissue. This soon develops into a malodorous soft rot which works downwards into the pseudo-stem, finally rotting the apical tissues of the bulb. The condition is apparently caused by the joint action of a species of *Fusarium*, identified by Reinking and Wollenweber as *F. moniliforme* var. *subglutinans* [ibid., xiii, p. 240], the spore beds of which occur on the surface of the diseased tissues, and of an unidentified small, rod-shaped bacterium, which was consistently isolated from diseased tissues at all stages of infection.

A brief account is also given of a condition observed for a number of years on the Dwarf Cavendish and Giant Fig varieties, which is considered to be due to a virus disease. Affected leaves are characterized by a distinct mottling, occasionally extending over the entire leaf surface as light chlorotic linear areas composed of irregular, broken, sometimes anastomosing, lines or stripes running

from the midrib to the leaf margin. The condition in Trinidad does not appear so far to affect the general health or productivity of the plants, but in its early stages it bears a close resemblance to the destructive heart rot virus disease of bananas recently described from Australia by Magee [ibid., x, p. 472; xii, p. 201]. The evidence available is, however, insufficient to decide whether the two diseases are identical.

TIMS (E. C.). **Stilbum on Fig in Louisiana.**—Abs. in *Phytopath.*, xxiv, 7, p. 843, 1934.

In cross-inoculation experiments *Stilbum cinnabarinum* from figs in Louisiana [*R.A.M.*, xii, p. 456] proved capable of attacking Pineapple pears [ibid., iii, p. 278; xii, p. 680] and Killarney roses (the latter slightly), but not plums, peaches, or pecans. The Celeste variety of fig was found to be more susceptible than larger, coarser types, such as Brunswick. The branches may contract infection through wounds or leaf scars. The excision of infected branches and painting the cut ends have so far failed to eliminate the fungus, and other control measures are under investigation.

BIRAGHI (A.). **Variazioni in due ceppi di 'Gloeosporium olivarum' Alm. di provenienze diverse.** [Variations in two strains of *Gloeosporium olivarum* Alm. from different localities.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 223–253, 18 figs., 1934. [English summary.]

A white strain of *Gloeosporium olivarum* [*R.A.M.*, xi, p. 226] isolated from olives sent from Greece gave rise in culture to a dark variant and this in turn gave four other variants, all of which remained constant. Another strain, from olives received from Portugal, had a dark grey mycelium like that of the first variant of the Greek strain and also gave rise to a variant. The original Greek strain, unlike its variants and the Portugese strain, did not form chlamydospores [see next abstract], while in repeated transfers it lost in great measure its ability to form hyphae and consisted largely of small conidia germinating by budding so as almost to resemble a yeast. Perithecia were not obtained from any of the forms.

As two strains not exactly agreeing with the description of the type species of *G. olivarum* were obtained from climatically different regions such as Greece and Portugal, and as their distinctive characters were to some extent bridged by the variants, the author tentatively suggests that in nature forms may exist specific for certain limited nutritional and environmental conditions [ibid., xi, p. 226].

A bibliography of 37 titles is appended.

BIRAGHI (A.). **Sul significato biologico dei presunti 'appressori' nel gen. Gloeosporium.** [On the biological significance of the presumed 'appressoria' in the genus *Gloeosporium*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 202–210, 3 figs., 1934. [English summary.]

After discussing the views held by different workers as to the chlamydosporal or appressorial nature of the brown organs develop-

ing at the apex of the germ-tube in *Gloeosporium* and *Colletotrichum* the author describes experiments in which, when the conidia of *G. olivarum* [see preceding abstract] were germinated in hanging drop cultures, these organs developed either at the margins of the drops, where, owing to evaporation, the germ-tubes were left dry, or at the base of the drop, in contact with the glass; in the latter case, their production increased with age. When the conidia were germinated in different liquids, the brown organs were most numerous in those poor in nutritive materials, especially distilled water. In weak solutions of copper sulphate their production was very precocious and intense. They were also noted on hyphae in old cultures. From these observations the author concludes that the organs in question are not appressoria but organs of conservation produced under unfavourable environmental conditions, and therefore analogous to chlamydospores.

DAVIES (C.). **A method to determine the surface area of trees covered by spray fluid and to obtain a permanent record of the degree of fineness of the deposit.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, p. 252, 1 pl., 1934.

To determine what surface area of sprayed trees has been covered by the spray fluid and obtain a permanent record of the degree of fineness of the deposit, transparent celluloid disks 2 in. in diameter are clipped to the trees before spraying is effected, the density of the dried deposit being increased if necessary by subsequently treating the disks with a suitable chemical (such as silver nitrate) which leaves no visible precipitate, but combines with the chemicals left by the spray. The disks, whether chemically treated or not, have a visible covering of spray and are used as negatives from which photographic prints are made, the percentage of cover obtained being determined by the eye. The disks can then be washed and used again. It was determined by examination that the surface tension between the spray fluid and the leaves of the variety of tree used was similar to that between the former and untreated celluloid disks, but occasionally it may be necessary to ascertain experimentally whether the disks collect the spray in the same way as the leaves, and if not, a transparent coating such as oil must be applied until they are similar.

MARTIN (H.) & SALMON (E. S.). **The fungicidal properties of certain spray-fluids. XI. Synthetic solvents.**—*Journ. Agric. Sci.*, xxiv, 3, pp. 469–490, 1934.

In the eleventh paper of this series [*R.A.M.*, xii, p. 576] the authors give a full account of their investigations of the fungicidal action on the conidial stage of *Sphaerotheca humuli* of manufactured hydrocarbons and their simpler hydroxyl-derivatives and esters. The sprays were prepared by agitation with 0·25 per cent. agral I.

Benzene, cyclohexane, methyl cyclohexane, dekalin, cymene, carvene, phellandrene, dipentine, turpentine, pine oil, geraniol, eucalyptus oil, and fenchone were phytocidal (i.e. injurious to the leaf in areas not invaded by the fungus) at the lowest concentrations at which they were fungicidal. α- and β- naphthol were

fungicidal at concentrations of 0·15 and 0·2 per cent., respectively, and, except in one experiment, were not phytocidal at concentrations under 0·5 per cent. As similar results were obtained with commercial grades of α- and β- naphthol, these appear to merit further trial for the control of powdery mildews. The polyhedric phenols and the phenolic acids tested were fungicidal only at concentrations at which serious leaf injury was caused. Saligenin, salicylaldehyde, and vanillin were inactive at concentrations of about 1 per cent., while paranitrophenol and picric acid were strongly phytocidal. Salicylanilide, applied in the form of its sodium salt (shirlan WS), was fungicidal at a concentration of 0·5 per cent., almost fungicidal at one of 0·25 per cent., and not injurious to the leaf at one of 1 per cent. Suspensions containing 1 per cent. salicylanilide were not fungicidal, but were more active when soap was used as the spreader. Solubility factors may influence the fungicidal behaviour of salicylanilide. None of the esters tested proved likely to be of practical value as a fungicide.

OSERKOWSKY (J.). **Fungicidal effect on Sclerotium rolfsii of some compounds in aqueous solution and in the gaseous state.**—*Phytopath.*, xxiv, 7, pp. 815–819, 1 diag., 1934.

The growth of the mycelium of *Sclerotium rolfsii* was inhibited by two to four days' exposure to saturated vapours at 29° to 30° C. of naphthalene, similar but stronger effects (resulting in the death of some of the cultures) being exerted by those of α-monochlornaphthalene and α-monobromnaphthalene. The mycelium was killed by the saturated vapours of trioxy-methylene, benzene, toluene, xylene, nitrobenzene, and ortho-, meta-, and paradichlorobenzene. The sclerotia of the fungus were destroyed by three days' exposure at 25° to 26° to the saturated vapours of benzene, toluene, xylene, ethylbenzene, n-propylbenzene, chlorobenzene, ortho- and metadichlorobenzene, 1-, 2-, 4-trichlorobenzene, nitrobenzene, chloroform, carbon tetrachloride, bromopicrin, iodine, carbon disulphide, and trioxymethylene. They were also killed by one day's immersion in 1 : 33 dilution of merthiolate or 0·1 per cent. solution of hexylresorcinol [cf. *R.A.M.*, xii, p. 509], and by five days in 0·1 per cent. o-chlorophenol. The substitution of an NO_2 radical in the benzene ring resulted in greater toxicity than that of either NH_2, Br, or 2 Cl atoms in the para position. The replacement of Cl by Br in chloropicrin [ibid., xiii, p. 98] enhanced the toxicity.

MUNRO (F. L.) & NEWTON (W.). **The inhibition of the growth of fungi by chemicals.**—*Scient. Agric.*, xiv, 10, pp. 560–564, 1934. [French summary.]

The authors carried out tests to determine the lowest concentrations at which a number of inorganic and organic chemicals [a list of which is given] inhibit the growth in pure culture of certain seed-borne fungi, namely, *Fusarium culmorum*, *Pythium ultimum*, and *Rhizoctonia* [*Corticium*] *solani*, supplemented by a study of the lowest concentrations (*dosis toxica*) [*R.A.M.*, ii, p. 555] at which these substances were toxic to wheat seedlings grown in Hoagland's nutrient solution. The object was to find solutions

that would be absorbed by seed in sufficient quantities to immunize it from fungal attack during the seedling stage of growth.

The results [which are tabulated] showed that with the exception of copper sulphate and copper nitrate, both at a concentration of 0·001 molar, all the chemicals tested more or less retarded the growth of the wheat seedlings, but no serious injury at concentrations higher than those required to inhibit fungal growth was caused by Cheshunt compound, copper acetate, potassium dichromate or cyanide, cresol, phenol, malachite green, chino[quino]sol [ibid., xi, p. 651], and mercurous sulphate. The ratio between '*dosis tolerata*' and '*dosis toxica*' was 10 in the case of phenol, cresol, quinosol, and malachite, while in the case of copper sulphate, acetate, or nitrate, Cheshunt compound, potassium cyanide or dichromate, lead chloride, and mercurous sulphate the ratio was 1. All the other chemicals, including zinc sulphate, mercuric chloride or cyanide, and silver nitrate, gave ratios below one, indicating that the concentration required to inhibit fungal growth is higher than the maximum concentration tolerated by the host.

Conference on co-ordination of agricultural research and plant protection. Held at Amani Research Station, 12th to 15th February, 1934.—Government Printer, Nairobi, iii + 56 pp., 1934.

The two chief purposes of this conference, held at Amani in February 1934 were to consider and co-ordinate the research programmes on coffee and on the pests and diseases of common crops in the British East African Territories, and to discuss the possibility of co-ordinating plant protection regulations in the Territories. Certain lines of work were designated as major projects (listed in a separate appendix), to be regarded as the special province of particular individuals or departments with special facilities for the work.

Careful consideration was given to the terms of a Plant Protection Ordinance to cover both the importation of plants from abroad and the regulation of their movement inside and between the territories, and it was decided to recommend uniform legislation on the lines of a draft Ordinance printed as Appendix VI to the report. The adoption is further recommended of a schedule of plant imports, classified under various degrees of restriction (Appendix VII on p. 45), based on a list, supplied by the Imperial Mycological Institute, of the principal diseases affecting these plants in external countries. It was recommended that the inter-territorial movement of plants should be subjected to the same regulations in regard to obtaining permits to import as those governing foreign imports.

RENN (C. E.). **Wasting disease of Zostera in American waters.**—*Nature*, cxxxiv, 3385, p. 416, 1 fig., 1934.

All the dark-coloured, spotted, diseased rhizomes and leaves of *Zostera marina* examined during 1933 along the coast of Massachusetts and New Jersey yielded thin-walled, tenuous, fusiform organisms, with terminal, often branching, delicate pseudopods, believed to be nearly related to the mycetozoan described under

the name of *Labyrinthula* by Cienkowski (*Arch. Microscop. Anat.*, iii, p. 274, 1867) as parasitic on marine algae. Neither bacteria nor the *Ophiobolus*-like fungi reported by other workers [*R.A.M.*, xiii, p. 716] could be detected. The air spaces of infected leaves were filled with net-like aggregates of the fusiform bodies, the members of which were connected by their filamentous pseudopods. In the zones surrounding the discoloured areas the organisms may occur in more loosely arranged chains. Within the cell the chloroplasts are disorganized and the nucleus disintegrated, the cell wall being free from injury except at the point of entrance of the pseudopod. Inoculation experiments with the *Labyrinthula*-like organism are in progress.

WIEDEMANN (H.). **Die Seegraskrankheit bedroht die deutsche Ostseeküste.** [The Sea Grass disease threatens the German Baltic coast.]—*Der Fischerbote* (*Norddeutsche Fischerei Zeit.*), xxvi, 7, pp. 228–229, 1934.

The sea grass [*Zostera marina*] disease [see preceding abstract] is stated to be nearing German waters if indeed it is not already present there. According to Danish reports [*R.A.M.*, xiii, p. 317] it extended in the autumn of 1933 to the island of Aarö in the Little Belt, to Nyborg in the Great Belt, and as far as the Nivaa Bay between Elsinore and Copenhagen in the Sound, whence it is travelling southwards. The inland waters bordering on the Baltic appear to be chiefly affected and the local eel, crab, and cod fisheries are suffering heavy damage.

FREISLEBEN (R.). **Zur Frage der Mykotrophie in der Gattung Vaccinium L.** [On the question of mycotrophy in the genus *Vaccinium* L.]—*Jahrb. Wissensch. Bot.*, lxxx, 3, pp. 421–456, 8 figs., 1934.

Mycorrhizal fungi similar to that isolated by the author from the roots of *Vaccinium myrtillus* [*R.A.M.*, xiii, p. 255] were also isolated from *V. vitis-idaea* and *V. uliginosum* and their identity with the fungi present in the mycorrhiza established by the synthetic formation of mycorrhiza in each of the hosts. As the cultures remained sterile, the fungi are designated *Mycelium radicis myrtilli* (of which two strains α and β were differentiated), *M. r. vitis-idaeae*, and *M. r. uliginosi*, respectively. They differed markedly from one another in cultural characters but less so in morphology, and bore no resemblance to *Phoma radicis callunae* Rayner, with which they were compared, nor did they appear to be in any way related to the genus *Phoma*.

Cross-inoculation experiments showed that the strains were not specific to their hosts; each was able to synthesize the mycorrhiza of all three of the above-mentioned species and also of *V. oxycoccus*. The epidermal cells were penetrated and filled with dense coils of hyphae. In some areas every cell of the epidermis was penetrated, in others only a larger or smaller proportion of them. The strains were not all equally virulent, *M. r. uliginosi*, for instance, causing only a relatively mild infection of *V. myrtillus*. In all cases the addition of the fungus stimulated the development of the seedlings.

Tests with other fungi showed, however, that this stimulatory

action was not the result of mycorrhiza formation. Even with common moulds such as *Penicillium glaucum*, in which no penetration of the roots occurred, the addition of cultures to 'pure culture' seedlings of the hosts exerted a stimulatory action of the same order as that caused by the endophytes. Tests with cultures of *Phoma r. callunae* gave the same result, but no penetration of the root or formation of mycorrhiza was observed.

The endophytes are, therefore, not specifically of value to the normal development of the plants tested. Whether the stimulatory action of the fungi is due to neutralization of some inhibitory substances (produced perhaps by the sterilization of the medium in which the seedlings are grown) by the metabolic products of the organisms, or the latter exert some direct stimulatory action on the seedlings, has not been determined.

The bearing of these results on those obtained by M. C. Rayner is discussed and the conclusion reached that an obligate symbiosis between fungus and host has not been established in the genus *Vaccinium*.

FRANCKE (H. L.). **Beiträge zur Kenntnis der Mykorrhiza von Monotropa hypopitys L. Analyse und Synthese der Symbiose.** [Contributions to the knowledge of the mycorrhiza of *Monotropa hypopitys* L. Analysis and synthesis of the symbiosis.]—*Flora*, N.F., xxix, 1, pp. 1–52, 15 figs., 2 graphs, 1934.

None of the procaulomes of *Monotropa hypopitys* (a holosaprophytic Pyrolaceae) [cf. *R.A.M.*, xiii, p. 718] examined by the writer in the vicinity of Würzburg, Germany, showed complete freedom from fungal infection, the intensity of which increased parallel with an augmentation in the humus content of the soil. Where the latter is low and infection correspondingly slight the ill-nourished procaulome is widely extended, with long lateral branches, and thus resembles the root system of autotrophic plants. *M. hypopitys* is evidently dependent on the fungal symbiont for its nutriment and affords an illustration of obligatory mycotrophy. The septate hyphae of the fungus form a pseudoparenchymatous mantle, especially dense on the younger, actively growing parts of the procaulome, and penetrating between the epidermal cells. The latter are entered, each by a single haustorium which swells into a bladder at the tip, the contents of which are finally liberated into the cell.

The fungus was isolated from plants growing in various types of soil and from both host varieties (*hirsuta* and *glabra*). On 3 per cent. malt agar a luxuriant white (later brownish) mycelium develops rather slowly. Scalariform anastomoses and hyphal fusions are frequent. The hyphae average 3 to 5 μ in thickness and are regularly septate at intervals of about 50 μ; with particularly favourable nutriment they may reach a diameter of up to 9 μ and produce intercalary, vesicular swellings up to 20 μ in diameter. Neither clamp-connexions nor conidia were observed, but as the cells of the mantle and of cultures from it are regularly binucleate, the fungus is considered to be the diploid stage of a Basidiomycete. A yellowish-brown pigment is diffused through the medium in the

presence of sufficient nutriment, and a pungent odour, recalling that of *Boletus* fructifications, is emitted by the mycelium. The minimum, optimum, and maximum hydrogen-ion concentrations for growth were determined as P_H 8·5, 5, and 2 to 2·5, respectively. Dextrose, maltose, dextrin, mannite, and humic acid were found to be good sources of carbon, while nitrogen was supplied by peptone, albumin, ammonium sulphate, urea, calcium nitrate, asparagin, and nucleic acid. Molecular atmospheric nitrogen was not fixed, even after the addition of readily assimilable nitrogen compounds. Better growth was made on softwood humus than on that from a beech wood. In the absence of fructifications the systematic position of the fungus could not be definitely ascertained, but a relationship with *Boletus* appears to be indicated.

The seeds of *M. hypopitys* were shown by experiments under controlled conditions to be capable of germinating independently of fungal aid, but the latter appears to be essential—at any rate in nature—to the further development of the seedling. Mycorrhizal synthesis was successfully accomplished, seedlings placed in pure cultures of the specific fungus making vigorous growth and forming a mantle. Negative results followed the use of various other Hymenomycetes.

CHABROLIN (C.). **La germination des graines de Thesium humile exige l'intervention de champignons saprophytes.** [The germination of *Thesium humile* seeds requires the intervention of saprophytic fungi.]—*Comptes rendus Acad. des Sciences*, cxcix, 3, pp. 225–226, 1934.

In nature the achenes of the annual Santalaceae, *Thesium humile*, a cereal parasite in Tunis, germinate without a host, but their cell walls were consistently found to be permeated by saprophytic fungi, such as *Alternaria tenuis*, *Macrosporium commune* [? *Pleospora herbarum*: *R.A.M.*, xi, p. 449], and *Cladosporium herbarum*, the presence of which was experimentally shown to be indispensable to the proper growth of the plant. The latter absolutely failed to germinate in an aseptic medium and developed only to a limited extent and after considerable delay in sterilized sand. In an aseptic medium the seeds germinate if the outer sclerenchymal layer is cut, and it is suggested that the function of the saprophytes in nature may be to soften the hard tissues, which then rupture and enable the internal tissues to absorb the necessary moisture.

CARBONE (D.) & ARATA (Mlle M.). **Sur le mécanisme de l'immunité acquise chez les plantes.** [On the mechanism of acquired immunity in plants.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 6, pp. 219–226, 1934.

Investigations [which are described] on certain histocytological aspects of plant immunity showed that the defensive reactions of beans [*Phaseolus vulgaris*] when inoculated through wounds with the 'toile' disease organism [*Botrytis cinerea*: *R.A.M.*, x, p. 612; xi, p. 779] consisted partly of the ordinary traumatic reactions but were also partly definite reactions against the pathogenic agent. The defensive reactions of vaccinated plants differed from those

of the controls only in the much greater intensity and rapidity of the former. The presence of the fungus appears to induce in the cells, even at some slight distance away, the formation of substances which inhibit fungal growth.

BERRY (J. A.) & MAGOON (C. A.). **Growth of microorganisms at and below 0° C.**—*Phytopath.*, xxiv, 7, pp. 780–796, 1 graph, 1934.

After a detailed review of the literature since 1887 regarding the growth of micro-organisms on foodstuffs preserved at low temperatures, the writers describe experiments which showed that a species each of *Cladosporium* and *Sporotrichum* from okra [*Hibiscus esculentus*] and peas, respectively, were the fungi that grew best at temperatures below −5° C. Spore germination of certain moulds has been observed at −7·78° and there were indications that mycelial growth can occur even below this. Microbial growth below −10° appears to be unlikely.

SHIMADA (S.). **Conidia formation in Trichoderma narcissi Tochinai et Shimada.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 223–224, 1 fig., 1934.

In cultures of *Trichoderma narcissi*, a parasite of *Narcissus* bulbs in Japan [*R.A.M.*, xi, p. 304], exposed in the laboratory to diurnal alternations of diffused light and darkness, dark green conidia were formed abundantly under the influence of light but no conidia developed in the dark, so that well-marked white and green zonation resulted [cf. ibid., iv, p. 628].

WANG (Mlle D. T.). **Contribution à l'étude des Ustilaginées (cytologie du parasite et pathologie de la cellule hôte).** [A contribution to the study of the Ustilagineae (cytology of the parasite and pathology of the host cell).]—*Le Botaniste*, Sér. xxvi, 4–5, pp. 540–670, 11 pl., 14 figs., 1934.

A detailed, fully documented account, supplemented by a bibliography of 126 titles, is given of the writer's cytological studies on some important smuts belonging to the Ustilaginaceae [cf. *R.A.M.*, xii, p. 210] and Tilletiaceae, considered under the following general aspects: structure and germination of the chlamydospores, cellular anastomoses and mycelial development, parasitic mycelium, fructification, sexuality, vacuome and cytome, and pathological modifications of the host cell.

SCHARRER (K.) & SCHROPP (W.). **Beiträge zur Frage der Wirkung des Bors auf das Pflanzenwachstum.** [Contributions to the question of the effect of boron on plant growth.]—*Landw. Jahrb.*, lxxix, 6, pp. 977–999, 7 figs., 1934.

A detailed, tabulated account is given of the writers' experiments at Weihenstephan, Munich, on the effects of boron on plant growth. On all types of soil (miocene sand, quaternary clay, and loess) where heart and dry rot of beets was prevalent, either naturally or in consequence of liming, the application of boric acid at the rate of 1 to 2 mg. per pot controlled the disease [see above, p. 743]. This result was found to be entirely unconnected with any re-

adjustment of the hydrogen-ion concentration of the soil, being apparently due in the first instance to some specific physiological or colloid-chemical property of the borate ion.

The yield of potatoes on limed and unlimed miocene sand was appreciably augmented by boron, which also exercised a moderately stimulatory effect on maize on clay soil.

KNOBLAUCH (H. C.) & ODLAND (T. E.). **A magnesium deficiency induced by previous fertilizer treatments.**—*Journ. Amer. Soc. Agron.*, xxvi, 7, pp. 609–615, 1934.

This is an extended account of the writers' investigations on the occurrence and control of potato chlorosis, associated with a high potash and low magnesium content of the soil in Rhode Island, a note on which has already appeared [*R.A.M.*, xiii, p. 537].

BÖHME (R. W.). **Das Vorkommen von Virosen auf dem Dahlemer Versuchsfelde.** [The occurrence of viruses on the Dahlem experimental field.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 1–58, 20 figs., 1934.

A comprehensive, tabulated account is given of the writer's further investigations on the nature of the virus diseases of potatoes occurring on the Dahlem (Berlin) experimental field [*R.A.M.*, xiii, pp. 319, 720]. The basis of the present studies was afforded by Köhler's observations on the rapid and progressive deterioration of the Gustav Adolf variety in this field since 1930 [ibid., xiii, p. 462]. Two types of degeneration may be distinguished, one (type A) characterized by streak necroses, mosaic, and curling of the pale green pinnate leaves, and the other (type B) by rugosity of the dull greyish-green lamina and a sharply acute angle of leaf insertion. Of these, the former may unequivocally be classified as streak [ibid., xiii, p. 464 *et passim*], whereas in the etiology of the latter, soil and atmospheric factors appear to play at least an equally important part with the leaf roll and X viruses subsequently obtained from affected plants.

Only one of the six G.A. [Gustav Adolf] plants showing no pathological symptoms was shown by stem grafting experiments (found in the author's experiments to be the most certain method of transmitting infection) on the same variety, *Datura stramonium*, and tomato to contain the 'healthy potato' (X) virus [ibid., xiii, p. 463 *et passim*]. Of 25 G.A. type A plants used in similar tests on Preussen, Wohltmann, Deodara, and Ackersegen potato varieties, *Petunia violacea* and *P. nyctaginiflora*, cultivated and wild (*Solanum racemigerum*) tomato, *D. stramonium*, *S. miniatum*, and *Hyoscyamus niger*, 16 were adjudged by the symptoms thus induced to contain the Y virus and 8 X + Y. The symptoms produced by the latter combination were more severe than when Y alone was present. Further tests with G.A. progeny showing symptoms resembling, but not identical with, type A were carried out (*a*) by rubbing with infective juice and (*b*) by aphid (*Myzus persicae*) transmission on eight standard potato varieties and White Burley tobacco. The results of these experiments pointed to the exclusive transmission of the Y virus, except in certain cases where leaf roll also was present and was transmitted. In

every case the presence of Y alone caused the most typical symptoms of the A kind, mixed infections causing various differences in the expression of the symptoms. Streak is a first-year symptom and is followed in subsequent years by the type A symptom complex. In Erstling [Duke of York] the Y virus induced a coarse, curling form of mosaic.

In the B type of disease in Gustav Adolf the presence of leaf roll and the X virus was demonstrated by similar methods. The X virus was transmitted by stem grafting to a number of test plants, the symptoms on several of which are described. In all cases where acronecrosis followed, only the X virus was determined to be present. Acronecrosis was also produced in Paul Krüger [President] potatoes by tuber grafting from Duke of York containing X. Further studies showed that in the case of the B type of symptoms, the stunting and rugosity of the foliage were conditioned by environmental factors, while the vertical habit of leaf growth may be interpreted as a second-year symptom of the leaf roll virus.

Symptomless G.A. plants reacted to grafting with G.A. and Kuckuck potato scions, containing the X virus in a latent and aberrant form, respectively, by the transient production of inconspicuous mottling on the youngest leaves. Reciprocal grafts of symptomless G.A. on Kuckuck and Duke of York gave negative results. From the transitional differences in symptom expression on *D. stramonium*, tomato, and tobacco it is concluded that the infective principles of these origins represent permanent modifications of the virus of relative stability, to which the names X_1 of Duke of York, X_3 of Kuckuck, and X_2 of Gustav Adolf are given. Under adverse conditions of growth the expression of acronecrosis may be modified to such an extent as to resemble Quanjer's acropetal necrosis [ibid., x, p. 746] or streak induced by the Y virus. In the chronic form of the disease the anatomical detection of necroses in the inner phloem seems to afford a more reliable diagnostic character than the external symptoms.

Only in one out of 31 greenhouse inoculation tests (by rubbing) could a virus be detected differing both from X and Y; its effects were visible on chilli (*Capsicum annuum*) fruits (but not on the leaves) in the shape of concentric rings, and it was taken to be a late infection by a weak strain of cucumber mosaic [ibid., xiii, p. 331]. The latter was further observed in five out of ten tobacco plants on an experimental plot near market-gardens infested by aphids and a thoroughly degenerated potato stand, while two other tobacco plants showed symptoms suggestive of 'coarse etch' [ibid., x, p. 60]. Two Ackersegen potato plants presented an appearance indicating the simultaneous presence of the ring spot and Y viruses. Previous observations on the same plot had revealed the occurrence of true tobacco mosaic.

TAUBENHAUS (J. J.). **Studies on Potato-scab control.**—Abs. in *Phytopath.*, xxiv, 7, p. 836, 1934.

Complete control of potato scab (*Actinomyces scabies*) was obtained in 1933 in east and east-central Texas by the application of sulphur in the furrows two to three weeks before planting at

rates varying from 500 to 1,500 lb. per acre in the neutral and calcareous soils, respectively [cf. *R.A.M.*, xiii, p. 536].

LEPIK (E.). **Kartulivähi geograafilisest levimisest.** [Geographical distribution of the Potato wart disease.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu* [Dorpat] 22 (Reprinted from *Agronomia*, xv, 7, pp. 270–273, 1934), 7 pp., 2 figs., 1 map, 1934. [German summary.]

In giving a list of the European countries, in which the author states that the potato wart disease (*Synchytrium endobioticum*) has been so far officially recorded, namely, Norway, Sweden, Russia, Poland, Germany, Denmark, France, Great Britain, Switzerland, Belgium, Holland, Austria, Hungary, Czecho-Slovakia, Rumania, and Malta [this is incorrect: wart disease has not been found in the Maltese Islands], he reports that the disease is not yet known to occur in Esthonia, where its importation is prevented by strict phytosanitary and quarantine measures. From England the potato wart disease is stated to have been introduced into the United States, Canada, Newfoundland, Peru, Japan, and South Africa.

POOLE (R. F.). **Sweet Potato ring rot caused by Pythium ultimum.**—*Phytopath.*, xxiv, 7, pp. 807–814, 3 figs., 1934.

Field and laboratory studies in New Jersey showed that *Pythium ultimum* is the agent of ring rot as well as of mottle necrosis of sweet potatoes [*R.A.M.*, vi, pp. 506, 748; xi, p. 331]. Infection occurs in the field through the stem ends and feed roots, but the heaviest losses are sustained during storage. The fungus was readily isolated from decaying sweet potatoes and grew well on a number of standard media. Pronounced rotting ensued 36 to 48 hours after the insertion of an active culture into the cortex, the tissues ultimately collapsing to form a depressed ring around the tuber. In a saturated atmosphere at 20° C., six well-developed rings were formed by six inoculations on a single sweet potato. The rot is of a greyish colour and moderately soft in consistency. Nancy Hall sweet potatoes harvested on 30th November, 1930, showed 100 per cent. infection by *P. ultimum* compared with 0, 3, and 8 per cent. for 15th, 20th, and 30th October, respectively, indicating the importance of lifting before the heavy rains. Positive results were given by inoculations with *P. ultimum* on bean [*Phaseolus vulgaris*: ibid., vi, p. 749; vii, p. 2], beet, potato [ibid., xiii, p. 563], turnip, and radish. *Rhizopus nigricans* failed to produce the typical ring rot symptoms in inoculation experiments.

GIGANTE (R.). **La maculatura grigia interna dei tuberi di Patata.** [Internal grey spot of Potato tubers.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 256–267, 8 figs., 1934. [English summary.]

An account is given of a condition affecting potato tubers in Italy and characterized by the presence in the parenchymatous and vascular tissues of light grey, scattered spots which darkened, became dry and spongy, and frequently cracked so as to form small cavities. In slight cases the spots were composed of necrosed, irregularly shaped cells containing normal starch, while in more

advanced forms the necrotic area was surrounded by a cork layer. The only external symptom (not invariably present) was bruising. When the vascular ring was affected the eyes in the part concerned died.

Three large-scale experiments demonstrated that the condition (which was not associated with any parasitic organism, and which the author does not regard as belonging to the virus group of diseases) was not hereditary, only 2 per cent., all of which showed marked bruising and spade injury, out of 1,000 tubers grown from affected seed pieces developing the condition.

That the condition was due to mechanical injuries, as was indicated by the nature of the lesions, was conclusively demonstrated by tests in which 50 per cent. (or practically the same proportion as that originally affected) of the current and previous years' healthy tubers after being kept under weights of 2 to 5 kg., subjected to hydraulic pressure, or hit with a hammer, and then stored for a fortnight in a well-aerated atmosphere, developed typical grey spot.

The paper concludes with brief recommendations for control by more careful handling of the tubers during storage and transport.

FUKUSHI (T.). **Plants susceptible to dwarf disease of Rice plant.** —*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 162–166, 1934.

It was shown by controlled experiments [the results of which are tabulated and briefly discussed] that the virus of rice dwarf is transmissible by the leafhopper *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xiii, p. 261] from diseased rice plants to *Panicum miliaceum*, *Echinochloa* [*P.*] *crus-galli*, *Alopecurus fulvus* L. [(?) *A. geniculatus* L.], and *Poa pratensis*. The symptoms on these plants are similar to those on rice, consisting in streaking and spotting of the foliage and general stunting. Rye, wheat, and oats are only slightly susceptible to rice dwarf and attempts at transmission to barley, maize, sorghum, and *Setaria italica* failed. The occurrence of the disease on *A. fulvus* is worthy of note, since this biennial wild grass is abundant in the rice fields and may possibly serve to carry the virus over the winter.

SAKAMOTO (M.). **Catenulate conidia formation in Ophiobolus miyabeanus Ito et Kuribayashi.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp, 237–240, 1 pl., 1 fig., 1934.

Ophiobolus miyabeanus, the perfect stage of the rice leaf spot fungus, *Helminthosporium oryzae* [*R.A.M.*, xiii, p. 256], in rice culm decoction agar cultures was observed to form catenulate, generally uni-, rarely pluriseptate, oval to elliptical, oblong, or cylindrical, sub-hyaline conidia, 4 to 20 by 4 to 7 μ, rarely up to 40 μ in length, which germinated readily in tap water with a germ-tube 5·6 to 7 μ in width. The chains were often branched, two or three rows of microconidia arising from one of those first produced. This type of conidial formation, which is somewhat reminiscent of that in *Alternaria*, appears to be a peculiarity of certain strains of *O. miyabeanus* occurring independently of environmental conditions. The chains may either be proliferated from

the terminal cell of an ordinary conidium or produced directly on a conidiophore.

TOCHINAI (Y.) & ISHIZUKA (K.). **The after effect of the fungus filtrate of Gibberella fujikuroi on Rice plants.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 148–152, 1 fig., 1934.

It was shown by experiments [the results of which are tabulated and briefly discussed] that the effects on rice seedlings of the filtrate from cultures of the 'bakanae' fungus (*Gibberella fujikuroi*) [*R.A.M.*, xiii, p. 652] are limited to the actual period of contact between the plants and the growth-promoting toxin. On transference of the treated seedlings from the sand cultures watered with the filtrate to a healthy culture bed containing farm soil, the abnormally elongated seedlings completely recovered from the disorder induced by the fungal toxin and yielded equally well with the controls.

IWADARE (S.). **Studies on Epicoccum oryzae Ito et Iwadare, n.sp.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 210–217, 2 figs., 1934.

The salient features of the writer's studies on *Epicoccum oryzae*, one of the agents of 'red blotch' of rice in Japan, have already been noticed from another source [*R.A.M.*, xiii, p. 538].

MURRAY (R. K. S.). **Oidium leaf disease in Ceylon in 1934.**—*Second Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 2, pp. 36–42, 1934.

In 1934 *Oidium* leaf disease [*O. heveae*: *R.A.M.*, xiii, p. 593] broke out with increased severity in most of the *Hevea* rubber-growing areas of Ceylon. Since the disease, once it becomes severe on any estate, tends to cause increasing damage in successive years, the present situation is not expected to improve unless control measures are widely adopted; otherwise, the disease will become increasingly severe at mid-country elevations, and may also do so in the low-lying districts, where in one area it was observed to be active as late as June and is perhaps becoming acclimatized. Under ordinary conditions sulphur dusting can be carried out on an estate scale in Ceylon at an average cost of 5 rupees [7/6] per acre per annum, excluding the price of the machine, which is about 1,200 rupees [£90] for the types used.

MURRAY (R. K. S.). **The sulphur dusting treatment for Oidium.**—*Second Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 2, pp. 43–53, 6 pl., 1934.

A brief, practical account, designed for the assistance of planters, is given of the sulphur dusting treatment of *Hevea* rubber against *Oidium* leaf disease [*O. heveae*: see preceding abstract] in Ceylon, the points dealt with including the circumstances when treatment is advisable, the equipment required, field technique, the time and number of applications, quantity of sulphur, field supervision, the provision of roads through the estate (strategically placed in relation to the prevailing breezes) along which the machine can be taken on a cart or lorry (at present it is ordinarily carried by hand

slung on poles), costs, danger of sulphur-tainting to tea in proximity to the rubber, and the limitations of the method. Dusting should be carried out at intervals not exceeding 10 days and is best done while moving the machine at right angles to the direction of the wind, in short bursts of five minutes or so. About 100 acres a day can be done with one machine; the quantity of sulphur required for each application varies considerably but with a seven-day interval 10 lb. per acre may be regarded as a maximum dose for severe infections. The paper concludes with a short summary for rapid reference.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1933.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 107–113, 1934.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 125] situation in England in 1933 the authors state that the first basal spike (in a non-sporing condition) was found in Kent on 27th March, and the first to bear spores on 3rd April; two days later, 291 were collected in a garden of six acres. By 10th May, terminal spikes were appearing in several gardens, the first fortnight of the month being showery and favouring spore production.

In August the disease was still active, but owing to hot, dry weather at the end of the month and in September, no spread occurred from any isolated source of infection, and the crop was the healthiest of recent years.

On one farm where very numerous basal spikes had been present early in the season, but where 'spiking' had been effected by two women twice a week from the start, no terminal or lateral spikes were found on 12th June and none of the leaves showed any sporing angular spots.

Some three-quarters of the total Kentish hop acreage received three applications of Bordeaux mixture, immediately before or after the appearance of the burr and again after its disappearance.

Evidence was obtained that applications to the hills of copper-lime dust [ibid., xii, p. 325] offers no prospect of appreciably reducing the number of basal spikes.

SCOTT (C. E.). **Downy mildew of Hops (Pseudoperonospora humuli) in California.**—*Plant Disease Reporter*, xviii, 7, p. 96, 1934. [Mimeographed.]

Downy mildew of hops (*Pseudoperonospora humuli*) is stated to be present in Sonoma and Mendecino Counties, California [*R.A.M.*, xii, p. 656], occurring in a serious form in about a third of the hop yards in the former county.

DAVIS (R. L.). **Sugarcane variety P.O.J. 2878 in Puerto Rico.**—*Puerto Rico Agric. Exper. Stat. Bull.* 35, 45 pp., 7 figs., 1934.

Along the entire north coast of Porto Rico the mosaic-resistant P.O.J. 2878 sugar-cane variety is being extensively planted to replace the susceptible B.H. 10(12) with highly satisfactory results [*R.A.M.*, xiii, p. 539]. In a two-year (1929–31) varietal trial at Central Cambalache, primavera canes (i.e., those planted in the

spring and harvested at 12 to 14 months) of P.O.J. 2878 outyielded B.H. 10(12), and gave an approximately equal sugar content (11·46 per cent.) though this was below that of S.C. 12/4 (12·87 per cent.). In the first ratoons, however, the sugar content of P.O.J. 2878 exceeded that of the other varieties (9·44 per cent. compared with 8·76 and 8·4 per cent. for S.C. 12/4 and B.H. 10(12), respectively). In the 1929–30 first ratoon crop P.O.J. 2878 outyielded B.H. 10(12) by an average of over 17 tons of cane per acre, the corresponding figure for 1930–1 being 28·42 tons, the total excess of sugar for the two crops combined being 4·1 tons over S.C. 12/4 and 5·17 over B.H. 10(12). In a 13-month primavera test at Central San Vicente the yield of P.O.J. 2878 exceeded that of B.H. 10(12) by 5·8 tons of cane and 0·579 ton of sugar per acre, the sugar content of both varieties again being approximately equal (over 11 per cent.). Details are given of a number of general field trials, in most of which P.O.J. 2878 compared favourably with the other varieties used, though it was outyielded by B.H. 10(12) in gran-cultura (i.e., cane planted in the summer or autumn and harvested at 16 to 18 months) at Fajardo and the eastern end of the island, especially in lowlands subject to flooding.

On the silty clay flat lowlands of Central Colosa the P.O.J. 2714 variety suffered severely from dry top rot (*Plasmodiophora*) [*Amoebosporus vascularum*: ibid., xii, p. 467].

WILES (D. R. D.). **Report of Plant Diseases Inspector.**—*Barbados Agric. Journ.*, iii, 2, pp. 39–44, 1934.

In this report on the work of the Barbados Department of Science and Agriculture for the year ending 31st March, 1934, notes are given by the Plant Diseases Inspector on the present position in the island as regards sugar-cane mosaic. The leaf symptoms of gumming disease [*Bacterium vascularum*: *R.A.M.*, xii, p. 788] were observed wherever the Ba. 11569 variety was cultivated, but no factory reported any difficulty in the manufacture of sugar from affected canes.

Report on the Agricultural Department, St. Kitts-Nevis, for the year ended 31st December, 1933.—Trinidad, Imper. Comm. of Agric., West Indies, 49 pp., 3 graphs, 1934.

On p. 38 of this report it is stated that gumming disease of sugar-cane [*Bacterium vascularum*] is on the increase in St. Kitts-Nevis, where 60 per cent. of the canes grown belong to susceptible varieties [*R.A.M.*, xii, p. 57], infection being observed in practically every field. On the other hand, no trace of mosaic was detected during the year.

DEY (P. K.). **The red rot of Sugarcane.**—*Dept. of Agric., U.P. Bull.* 66, 4 pp., 1 pl., 1933. [Received September, 1934.]

A semi-popular account is given of red rot of sugar-cane (*Colletotrichum falcatum*), which is stated to be causing considerable damage of late years in the United Provinces, India [cf. *R.A.M.*, viii, pp. 266, 549], with directions for its control by thorough field sanitation, supplemented in cases of heavy infestation by a four- to five-year crop rotation.

TAKASUGI (H.). **Additional list of the fungi of Manchukuo (first note).**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 185–190, 1934.

A list is given of 52 species of parasitic fungi collected from 1926–33 in Manchukuo (Manchuria), 42 of which were not recorded by Miura in his 'Flora of Manchuria and Mongolia, Part III', 1928 (*Indus. Mat.*, xxvii, S. Manchuria Ry. Co., 1928), while 10 are now reported on new hosts. Some of the Erysiphaceae included in the present list were previously investigated by Miss Homma [*R.A.M.*, x, p. 273].

The following are among the items of special interest. Rice was attacked by *Sclerospora oryzae* Brizi [usually referred to *S. macrospora* Sacc.: ibid., xi, p. 222; xii, p. 537], *Phyllosticta oryzaecola*, and *Gibberella fujikuroi* [see above, p. 801]. *Taphrina truncicola* Kusano was observed on *Prunus glandulosa* and *P. mongolica*. Sunflowers (*Helianthus annuus*) were infected by *Erysiphe cichoracearum* [ibid., xii, p. 571]. *Mycosphaerella maydis* occurred on maize [ibid., xii, p. 505]. Cotton was attacked by *Glomerella gossypii* [ibid., xii, p. 395] and *Phyllosticta gossypina* [ibid., xi, p. 638]. *Dioscorea batatas* Decne. was infected by *P. dioscoreae*. *P. phaseolorum* [ibid., xii, p. 330] occurred on *Phaseolus radiatus* var. *aurea*. Tobacco was attacked by *Alternaria tabacina* and *Macrosporium* [*A.*] *longipes* [ibid., xii, p. 748]. *Cercospora raciborskii* [*C. vignae-sinensis*: see next page] was observed on cowpeas. Maize was infected by *Helminthosporium maydis* [ibid., xiii, p. 366] and *Panicum miliaceum* by *H. panici-miliacei* and *H. yamadai* [ibid., viii, p. 530].

TOGASHI (K.) & ONUMA (F.). **A list of parasitic fungi collected on Mt. Hayachine, Iwate Prefecture.**—*Bull. Imper. Coll. of Agric. & Forestry* (Morioka, Japan), xvii, 74 pp., 11 figs., 1934.

An annotated list is given of 184 species of parasitic fungi collected between 1928 and 1932 on Mt. Hayachine, Iwate Prefecture, Japan, of which eleven are regarded as new to science and provided with Latin diagnoses. Fungus and host indices are appended.

CASH (EDITH K.). **Alaskan fungi.**—*Plant Disease Reporter*, xviii, 7, pp. 74–88, 1934. [Mimeographed.]

An annotated list is given of 159 fungi collected in Alaska by N. E. Stevens and J. P. Anderson in 1922 and 1923, respectively, some of which are believed to be new records for North America.

MATSUMOTO (T.). **Some remarks on the taxonomy of the fungus Hypochnus sasakii Shirai.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 115–120, 2 figs., 1934.

A table is given showing the principal vegetative and growth differences between *Corticium sasakii* [*R.A.M.*, xiii, p. 725] and *C. solani*, the former isolated from rice in Japan and the latter from potato in Germany [ibid., xii, p. 331]. There are also certain differences between these two organisms in the perfect stage, the basidial sterigmata of *C. sasakii*, for instance, numbering 2 to 4 and measuring 5 to 8 by 2·2 to 2·7 μ, compared with 4 to 6

(measuring 6 to 16 μ) for *C. solani*. The dimensions of the basidia in *C. sasakii* are 10 to 16 by 8 to 9 μ and in *C. solani* 10 to 20 by 7·5 to 11 μ, the corresponding basidiospore measurements being 6 to 10 by 4 to 7 and 8 to 14 by 4 to 6 μ respectively. Considered alone these divergences in the perfect stage are insufficient to justify specific separation, but in conjunction with the vegetative differences they afford additional grounds for regarding *C. sasakii* as distinct from *C. solani*. Attention is drawn to some very close resemblances between *C. sasakii* and *C. koleroga* [ibid., vii, p. 249; xiii, p. 230], studies on the possible relationship of which are in progress. Pending their completion the name *C. sasakii* should be retained.

BRUNDZA (K.). **Medžiaga Lietuvos Erysiphacejoms pažinti.** [Contribution to the knowledge of the Lithuanian Erysiphaceae.]—*Žemės Ūkio Akademijos Metraščio*, Kaunas [Kovno], *1933*, pp. 107–197, 2 pl., 10 figs., 11 diags., 1 graph, 1934. [German summary.]

This is stated to be the first attempt to bring together and systematize the information available in the literature on the Erysiphaceae of Lithuania. A few general considerations on the morphology and biology of the organisms, a description of the methods used by the author in his investigation, and a key to the genera and species of the Erysiphaceae are given. This is followed by a brief description of 54 species (*sensu* Blumer) [*R.A.M.*, xiii, p. 127], belonging to six genera, based mainly on the author's personal studies, together with a list of the 233 host plants on which they were found in Lithuania, and some ecological notes of local interest. Special attention was given to the study of conidial shapes and to the *Oidium* types in the species investigated, and an attempt is made to classify them as either *Pseudoidium* or *Euoidium* (*sensu* Jaczewski) [ibid., vii, p. 346].

YAMAMOTO (W.). **Cercospora from Formosa I.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 139–144, 3 figs., 1934.

Taxonomic notes are given on nine species (five new) of *Cercospora* collected in Formosa in 1933 of which the following may be mentioned. Living foliage of *Hibiscus esculentus* was attacked by *Cercospora malayensis* [*R.A.M.*, xi, p. 130]. *C. neovignae* nom. nov. is the proposed designation for *C. vignae* Rac. (non Ell. et Ev.) and *C. raciborskii* Mats. et Nag. (non Sacc. et Syd.) on living cowpea leaves [but see ibid., xiii, p. 657, where the new name *C. vignae-sinensis* Tai & Wei (1933) is proposed for this fungus].

C. mucunae-ferrugineae n. sp. forms irregular, yellowish-brown, later dingy brownish-black, ultimately dark brown to brownish-grey, confluent lesions, often covering a large part of the surface, on living leaves of *Mucuna ferruginea*. It is characterized by pale olive hyphae, 2 to 3 μ in diameter, which emerge from the stomata and cover the spots with a creeping olivaceous mycelium; simple or branched, straight or curved, stipitate, continuous or 1- to 7-septate, pale olive-brown conidiophores, arising singly or in groups of two or more from the stomata or singly from the superficial mycelium, 13 to 62 by 3 to 4 μ; and pale olive, cylindrical or

obclavate-acicular, straight or slightly curved, 1- to 12-septate conidia, 23 to 130 by 3 to 4·5 μ.

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1932–30 April 1933.—*Proefstat. Vorstenlandsche Tabak, Meded.* 77, pp. 34–48, 3 figs., 1934.

The new form of tobacco mosaic, characterized by wispy leaves, to which attention was drawn in the previous report [*R.A.M.*, xii, p. 118], again caused severe damage at Ketandan, while at Wedi the same virus produced an extensive white spotting of the foliage. There is stated to be no doubt that ordinary mosaic is disseminated by coolies in the course of cultural operations [cf. ibid., xiii, p. 730], and it is reasonably certain that the Java manufactured tobacco constitutes the mosaic reservoir for the Vorstenland.

The results of two years' observations afford no definite clue as to the cause of the varying prevalence of slime disease [*Bacterium solanacearum*: ibid., xiii, p. 659] on different plots of the same field.

In general the incidence of 'lanas' disease [*Phytophthora parasitica nicotianae*: ibid., xii, p. 471] was low during the period under review, but on a number of new plantations in which sugarcane preceded tobacco considerable damage was observed. It was ascertained that during the cane period the fields had all been irrigated with water from old tobacco areas. Sulphuric acid ($7\frac{1}{2}$ l. of a 2·5 per cent. solution per sq. m.) showed some promise, when applied about three weeks before planting, as a soil disinfectant, but cannot be used on a commercial scale unless its injurious action on the foliage can be prevented, e.g. by subsequent applications of lime.

Mildew [*Erysiphe cichoracearum*: ibid., xii, p. 118] caused much more extensive injury than in 1931.

THUNG (T. H.). **Bestrijding der krul- en kroepoek-ziekten van Tabak.** [Control of the curl and crinkle diseases of Tobacco.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 78, 18 pp., 3 diags., 1934. [English summary.]

During the growing season of the Vorstenland (Java) tobacco crop the plants are visited by numerous whiteflies (Aleyrodidae, probably a species of *Bemisia*), which have already been shown to transmit the viruses of the curl and crinkle diseases [*R.A.M.*, xi, p. 478; xiii, p. 274]. The insects come from many weeds, but an extensive series of infection experiments with whiteflies from different food plants showed that only three, namely, *Ageratum conyzoides*, *Synedrella nodiflora*, and *Vernonia cinerea*, which occur in profusion in the Klaten district and elsewhere near the outskirts of villages, normally are capable of serving as a source of infection to tobacco. In a few cases infection was transmitted from cassava and (more doubtfully) from cucumber. But the three first-named weeds are those which normally carry the disease over during the time when there are no tobacco plants in the fields. Practical control of the diseases was secured in 1933 by the timely removal (in the middle of June, July, and August) of these three

main sources of infection over a radius of some 50 m. round the villages. The work was inexpensively carried out by gangs of children, and its value shown by the virtual absence of curl and crinkle from the eradicated areas in comparison with the heavy damage occurring where these measures were not taken.

VALLEAU (W. D.). **Rhizoctonia bataticola causing sore shin of Tobacco in Kentucky.**—*Plant Disease Reporter*, xviii, 9, p. 117, 1934. [Mimeographed.]

Rhizoctonia bataticola [*Macrophomina phaseoli*] was isolated in July, 1934, from tobacco plants near Murray, Kentucky, suffering from 'sore shin' [cf. *R.A.M.*, ix, p. 561; xi, p. 104]. Some 5 to 10 per cent. of the stand was affected by the disease, which was marked in the early stages by the burning or wilting of the lower leaf tips, followed by their gradual death. Large, black lesions next developed on the stalk round the leaf base, following a die-back of the midrib. The pith decayed in advance of the injury to the leaf and this was preceded by a dark streaking of the cambium. Infection evidently occurred early.

MCWHORTER (F. P.). **Additional note on the English form of Tomato spotted wilt in Oregon.**—*Plant Disease Reporter*, xviii, 5, p. 48, 1934. [Mimeographed.]

No evidence was forthcoming among the ornamental plants or weeds growing in association with tomatoes affected by the English form of spotted wilt in Oregon [*R.A.M.*, xiii, p. 662] of a native virus disease as a potential source of infection. It is concluded, therefore, that the disorder must have been introduced on seed imported direct from England.

CHAMBERLAIN (E. E.). **Tomato mosaic. Its appearance, cause, and preventive treatment.**—*New Zealand Journ. of Agric.*, xlviii, 6, pp. 344–351, 5 figs., 1934.

Tomatoes in New Zealand, especially under glass, are sometimes seriously affected both by mild [ordinary] and severe [? aucuba] mosaic, the symptoms of which are very briefly described [*R.A.M.*, xii, p. 731]. In a small range of field trials at Palmerston North, the average yield of diseased plants was reduced by 39 and 91·2 per cent. by mild and severe mosaic respectively, and both diseases were transmitted from tomato to tobacco, Cape gooseberry (*Physalis peruviana*), and black nightshade (*Solanum nigrum*). The mild form is prevalent on tobacco in the Nelson and Auckland districts, and was also identified in naturally infected Cape gooseberry sent to the laboratory. Severe mosaic is not known to occur naturally on any host other than the tomato in New Zealand.

The fact that in a trial at the Plant Research Station healthy tomato plants growing alongside plants infected with mild or severe mosaic did not contract the diseases, although the aphids *Macrosiphum gei* and *Myzus persicae* were abundant on the diseased and healthy plants during the early part of the season, is considered to indicate that spread of the diseases by these insects is not extensive in the field. The indications are rather that both

mild and severe mosaic are mainly disseminated in New Zealand by pruning knives and the hands of the cultivators, and experience at the Station has shown that the virus may be removed from the hands by thorough washing with soap and running water. In a glasshouse test it was further shown that of 84 plants grown from seed collected from mild mosaic plants, five developed the disease, and evidence obtained from commercial glasshouses in the Nelson district would indicate that the use of seed from infected plants is an important factor in perpetuating the disease from one season to the next [cf. ibid., xiii, p. 648]. Inoculation experiments showed that the incubation period varies from six days in the summer to three weeks in the winter. Once mosaic has appeared in a crop, an interval of about 14 days should be left between prunings, so that there will be sufficient time for all plants infected at one pruning to show the characteristic symptoms and to be removed before the next pruning.

RISCHKOW [V. L.] & KARATSCHEWSKY [I. K.]. **Ueber die Entstehung von 'Fern-Leaf' bei Tomaten.** [On the origin of 'fern leaf' in Tomatoes.]—*Phytopath. Zeitschr.*, vii, 3, pp. 231–244, 9 figs., 1934.

Of 28 tomato seedlings (Markwunder variety) inoculated under controlled conditions (at Simferopol, Russia) with the mosaic virus, 17 contracted the typical fern-leaf and filiform symptoms [*R.A.M.*, xii, p. 778] within a period of 7 to 14 days. The juice of the diseased plants was found, on inoculation into a fresh series of seedlings, to have an intensified virulence resulting in 100 per cent. fern-leaf infection.

In the infected tomato seedlings the leaves were involved to a very variable extent from a few lobes or the tips to the entire surface; in the latter case only the main or lateral veins were left, and some of the leaves presented the appearance of thin tendrils. Where a leaf blade remained, mosaic symptoms were more or less apparent though sometimes almost masked. The flowers of diseased plants were often stunted, with narrow sepals and petals, and frequently fell without producing fruit.

The virus extracted from the fern-leaf tomato plants was found to resist desiccation for a period of eleven months, so that it falls into [E. M.] Johnson's group of tobacco mosaic viruses [ibid., x, p. 60]. It also resisted putrefaction for nine months. It survived ten minutes' heating at a temperature of 88° to 92° C., beyond which it was inactivated. Its virulence was retained after passage through Chamberland porcelain candles. Virulence was not appreciably impaired by 30 minutes' exposure to ether fumes. From a consideration of the properties of the virus under observation and from the practically complete success of the needle inoculation experiments undertaken with it, the writers conclude that it is distinct from Mogendorff's infective principle, though the symptoms caused are similar in both cases [ibid., ix, p. 417]. Seven tobacco seedlings inoculated by needle pricks developed chlorosis of the leaves in 4 to 7 days, beginning along the veins at the base and spreading upwards, accompanied by stunting, vesicular puckering of the green parts, disturbance of starch translocation as observed

by Holmes [ibid., xi, p. 334], and malformation, but only in two cases by the filiform symptoms occurring in tomato; the fern-leaf virus was successfully transferred back to tomato, the incubation period in this case being 12 days. Manifestations of the filiform type were further noticed in nature in *Hyoscyamus niger* and *Nicandra physaloides* plants growing in or near mosaic tomato beds, while a severe epidemic of a similar disease was observed in burdock (*Lappa*) [*Arctium lappa*].

Inoculation experiments were also carried out on tomatoes with a number of other viruses to ascertain if they could produce filiform symptoms. Positive results were obtained only in two out of 100 plants inoculated with potato degeneration viruses (miscellaneous), in all three infected by a virus from pepper [*Capsicum annuum*] with profuse growth of shoots and reduction of fruiting [cf. ibid., xii, pp. 119, 402], and in 7 out of 12 inoculated with severe tobacco mosaic. None of the 11 plants inoculated with cucurbit mosaic contracted infection [cf. ibid., v, p. 510; xiii, p. 648]. The similarity of the fern-leaf symptoms to those of certain mutants is pointed out and the suggestion made that there may even be in some cases a symbiotic relationship between the virus and its host plant.

WEBER (G. F.). **Studies on nailhead spot of Tomatoes.**—Abs. in *Phytopath.*, xxiv, 7, p. 836, 1934.

The fungus causing nailhead spot of tomatoes, a common and destructive disease in the south-eastern and Gulf States, has been shown by cultural studies to be a species of *Alternaria*, and the new combination *A. tomato* (Cke) is proposed for *Macrosporium tomato* Cke [*R.A.M.*, x, p. 767]. The organism is stated to differ morphologically and physiologically from the early blight pathogen *A. solani*, with which it is liable to confusion owing to the somewhat similar symptoms produced. Conidia of the two species collected in nature or developed in pure culture were found to be consistently distinct from one another.

DAY (W. R.). **Development of disease in living trees.**—*Brit. Wood Preserving Assoc. Journ.*, iv, pp. 25–44, 1 pl., 5 diags., 1934.

In this paper, which was read at a meeting of the British Wood Preserving Association in January 1934, the author briefly reviews the environmental and cultural conditions that favour the attack on, and development in, living forest trees in England, of wood-destroying fungi. He gives illustrations drawn, among others, from the attacks of *Stereum spadiceum* on oak, *Ustulina zonata* [*R.A.M.*, xiii, p. 597], *Phytophthora cambivora* [ibid., xii, p. 334], and *P. syringae* on the beech, as well as from various butt rots and heart rots caused by several well-known fungi. A highly important factor tending to increase the susceptibility of whole tree stands to decay-causing organisms is the failure by the silviculturist to recognize that once a tree has begun to form large branches, the central tissues of which have ceased to participate in the active movement of sap, it should no longer be crowded in such a way as to entail the continued death of its branches by

suppression, because of the grave risk of heart-rotting organisms entering the bole from the dead limbs. Of at least equal importance is the fact that debilitated stands, whether owing to diseases of the crown or of the root system, are in a much more favourable condition for the development of timber-decaying organisms, and also that any diseased condition of the large root system leading to its partial or total death inevitably results in the entry of heart-rotting fungi into the main stem. The paper terminates with a brief discussion of control measures.

HRUBY (J.). **Beiträge zur Pilzflora Mährens und Schlesiens.** [Contributions to the fungus flora of Moravia and Silesia.]—*Verh. Naturforsch. Verein Brünn*, lxiv (*1932*), pp. 34–49, 1933. [Received 1934.]

An annotated list, supplemented by a four-page bibliography, is given of 104 Basidiomycetes (Thelephoraceae) occurring in Moravia and Silesia and represented in the herbarium of the Brünn [Brno, Czecho-Slovakia] National Museum. Included in the compilation are seven species of *Aleurodiscus*, including *A. amorphus* on the cortex of conifers [*R.A.M.*, xiii, p. 608], *Stereum gausapatum* and *S. spadiceum* on oak stumps [see preceding and next abstracts], *S. rugosum* [ibid., xiii, p. 334] on poplar, *Carpinus*, oak, beech, and *Prunus mahaleb*, *S. pini* and *S. sanguinolentum* on conifers, and *Hymenochaete tabacina* on *Corylus avellana* and *P. spinosa*.

DAVIDSON (R. W.). **Stereum gausapatum, cause of heart rot of Oaks.**—*Phytopath.*, xxiv, 7, pp. 831–832, 1934.

Many of the unidentified cultures from rotting oaks that have accumulated since 1928 at the Division of Forest Pathology, Bureau of Plant Industry, Washington, D.C., are now referred (as a result of comparison with cultures made from spores) to *Stereum gausapatum* [*R.A.M.*, xiii, p. 334], which has been isolated from *Quercus prinus, Q. alba, Q. coccinea, Q. velutina, Q. rubra*, and *Q.* sp. in seven States. The fungus forms white lines through the wood, giving a characteristic mottled appearance; they usually follow the spring wood vertically but often branch and sometimes penetrate through the annual growth rings. In the final stages of decay all the wood becomes pale and brittle. Investigations by Nelson and Hedgcock in 1928 of a third-generation coppice in Pennsylvania are stated to indicate the increasing importance of *S. gausapatum* as an agent of decay in sprout-grown oaks. *S. spadiceum*, given by Burt as a synonym of *S. gausapatum*, causes a rot of standing oaks in France [ibid., xii, p. 796].

BOUDRU (M.). **L'oïdium du Chêne.** [Oak mildew.]—*Bull. Soc. Centr. Forest. Belgique*, xli, 7, pp. 270–283, 1934.

A popular account is given of oak mildew (*Microsphaera quercina*) [*R.A.M.*, xii, p. 542], the chief points dealt with including the symptoms of the disease, the morphological and biological characters and manner of overwintering of the causal organism, spread over Europe, varietal resistance [ibid., vi, pp. 198, 452; xi, p. 767], and control [ibid., viii, p. 687]. The resistant varieties are stated to include *Quercus macrocarpa, Q. nigra, Q. phellos*, and *Q. palustris*.

In Belgian nurseries excellent control is given by spraying at the end of May and about the middle of June with 0·2 per cent. potassium sulphide.

A bibliography of 27 titles is appended.

KELLERMAN (K. F.). **Status of the Dutch Elm disease.**—*Plant Disease Reporter*, xviii, 7, p. 101, 1934. [Mimeographed.]

In an area of some 1,400 sq. miles around the port of New York and involving portions of New York State, New Jersey, and Connecticut, the wilting of elms due to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xiii, p. 734] was determined in 1933, while in spite of active eradication measures during the winter more than 1,000 cases were found, as a result of overwintering of the infection, in the early summer of 1934. Up to 1st July a total of 1,706 diseased trees had been reported in this area, and it is estimated that there may be as many as 5,000 showing symptoms. This is exclusive of the current season's infections which have not yet had time to become visible.

GOIDÀNICH (G.). **La verticilliosi dell' Acer platanoides L., dell' Acer pseudoplatanus L. e della Maclura aurantiaca L.** [Verticilliosis of *Acer platanoides* L., *Acer pseudo-platanus* L., and *Maclura aurantiaca* L.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 268–272, 3 figs., 1934. [English summary.]

In 1933 the foliage of an *Acer platanoides* tree growing at Bologna suddenly wilted. The tree was cut down, and a *Verticillium* with micro-sclerotia [*R.A.M.*, xii, p. 338] was found in the wood. The fungus had long been present in all parts of the trunk, as well as in the roots, but in the smaller branches it was confined to the previous year's ring. The affected parts were very irregularly distributed, the tree, contrary to the behaviour of this species in America [ibid., v, p. 641] having strongly resisted the spread of the mycelium; there was no outward sign of infection, the bark remaining unaltered.

Tracheomycosis due to a similar *Verticillium* was observed on one- and two-year old sycamore (*A. pseudo-planatus*) trees (the first record in Italy on this host) in nurseries at Padua where *A. platanoides* and *Maclura aurantiaca* were also affected, the wood of the last-named showing a chestnut-coloured discoloration. This is stated to be the first record of the disease on *Maclura*.

These cases confirm the widespread nature of tracheoverticilliosis in Italy, where nursery stock is particularly susceptible.

MILLER (P. W.). **Bacterial blight on native Hazel in Oregon.**—*Plant Disease Reporter*, xviii, 9, pp. 117–118, 1934. [Mimeographed.]

Attention is drawn to the recent detection of bacterial twig blight on the native wild hazel (*Corylus californica*) [*C. rostrata* Ait.] in Oregon, the causal organism being indistinguishable in culture from that responsible for the similar disease of the cultivated filbert (*C. avellana*) [?*Bacterium juglandis*: *R.A.M.*, x, p. 163]. The pathogenicity of the bacterium from *C. californica* to *C. avellana* was experimentally demonstrated. This is believed to be

the first definite record of the occurrence of bacterial blight on the wild hazel.

DEMAREE (J. B.), FOWLER (E. D.), & CRANE (H. L.). **Control of Pecan roset with zinc sulfate.**—*Proc. 28th Ann. Convent. South-eastern Pecan Growers' Assoc.*, pp. 29–37, 1934. [Abs. in *Chem. Abstracts*, xxviii, 19, p. 6233, 1934.]

The best control of pecan rosette in the south-eastern United States [*R.A.M.*, xiii, p. 135] was obtained by spraying the leaves of growing shoots with a solution of zinc sulphate (1 lb. in 50 galls. water), the first application being given in April, followed by two more at monthly intervals. Satisfactory but less striking results were secured by combined treatment with zinc sulphate and Bordeaux mixture, while a stimulatory effect (still noticeable in the second year) was further exerted by the injection into the trunk of dry zinc sulphate (0·5 to 1·5 lb. per in. of circumference). The effect of soil treatment with zinc sulphate was slower and less uniform than the preceding.

DEMAREE (J. B.) & LARGE (J. R.). **Injurious effects of Bordeaux mixture on Pecan trees.**—*Proc. 28th Ann. Convent. South-eastern Pecan Growers' Assoc.*, pp. 20–29, 1934. [Abs. in *Chem. Abstracts*, xxviii, 19, p. 6238, 1934.]

Even at very dilute concentrations Bordeaux mixture has been found to cause three distinct types of injury to pecan trees (1) marginal and apical leaf burning followed by a checking of growth in very young foliage; (2) brown spotting and necrosis in June or July after the second or third application, succeeded in a week or two by the shedding of 25 to 50 per cent. of the older leaflets; and (3) in periods of drought only, coincident with increased transpiration, wilting of the nuts, chlorosis and shedding of the leaves, and usually failure of blossom in the next year. No injury is caused by a spray consisting of 2 lb. copper phosphate, 4 lb. hydrated lime, and 2 lb. bentonite [*R.A.M.*, xiii, p. 715] in 50 galls. of water, but the pecan scab fungus [*Cladosporium effusum*: ibid., xiii, p. 135] is not so effectively combated by this compound, or by sulphur-containing mixtures, as by Bordeaux mixture.

CELINO (M. S.). **Blight of Cinchona seedlings.**—*Philipp. Agric.*, xxiii, 2, pp. 111–127, 2 pl., 2 figs., 4 graphs, 1934.

In February 1932 a severe epidemic of disease among *Cinchona* seedlings in the Los Baños College of Agriculture was reported, and in January, 1933, another serious attack occurred on 45·45 per cent. of a batch of seedlings raised from seed supplied by the College of Forestry. The disease assumed the form of sudden decay and desiccation of the young shoots without obvious preliminary changes. Infection progressed downwards from the tips and caused gradual withering of the stem and leaf petioles, followed by the death of the leaves, which generally remained attached to the plants. The plants were killed in five or six days under moist conditions.

A species of *Phytophthora* was readily isolated from diseased

material and cultured on standard media [cf. *R.A.M.*, xi, p. 426]. It was characterized by a coarse, irregular, profusely branched submerged mycelium with hyphae averaging 6·65 μ in diameter, compared with 5·47 μ for those of the more slender aerial growth. The conidiophores ranged from 2·5 to 6·3 μ (average 3·58 μ) in width and bore, terminally or laterally, subspherical, oval, or elongated, hyaline to pale yellow, densely granular, apically papillate conidia, measuring 19·5 to 97·49 by 15·5 to 51·49 μ (average 48·63 by 32·06 μ). The spherical, smooth, terminal or intercalary chlamydospores, slightly deeper in colour than the conidia, range from 19·5 to 51·49 μ in diameter (average 35·89 μ). Zoospores were formed in the presence of abundant moisture in 20 to 25 minutes at 15° C. They remained actively motile for about half an hour, subsequently producing germ-tubes some 10 to 20 minutes after settling. They are slightly elongated and pointed in motion, spherical when at rest, pale greenish, granular, and measure 8·4 to 12·6 μ in diameter (average 10·75 μ). The dimensions of the fungus [which are fully tabulated] are considered to agree sufficiently well with those of *P. faberi* [*P. palmivora*: ibid., xiii, p. 12 and above, p. 764] to permit its reference to this species.

Positive results were obtained by inoculation experiments on unwounded seedlings of the *C. hybrida* and *C. calisaya* var. *ledgeriana* varieties, both of which, with *C. succirubra*, had been severely infected under natural conditions. Good control was secured by the excision and burning of diseased material, supplemented by two applications, at a fortnight's interval, of standard Bordeaux mixture.

HIRATSUKA (N.). **Inoculation experiments with heteroecious species of the Japanese rust fungi II.**—*Bot. Mag.*, Tokyo, xlviii, 571, pp. 463–466, 1934.

The alternate hosts of *Coleosporium campanulae* from *Adenophora verticillata* var. *typica* were found to be *Pinus thunbergii* and *P. densiflora*, while that of *C. asterum* from *Aster leiophyllus* is *P. densiflora* [cf. *R.A.M.*, xiii, p. 201]. The aecidiospores of the former species were successfully inoculated into *Adenophora verticillata* vars. *typica* and *triphylla*, *A. nikkoensis* var. *genuina*, and *A. takedai*, while those of the latter infected only *Aster leiophyllus* of the five plants tested.

The spermogonia of *C. campanulae* on *P. thunbergii* are yellowish-brown, low-conical, 50 to 80 μ in height and 0·5 to 1·2 mm. across; the aecidia are up to 3 (occasionally 7) mm. long, and 0·8 to 1·5 mm. high; the peridial cells are ovoid to ellipsoid, slightly overlapping, often tapering at one or both ends, 40 to 60 by 20 to 36 μ, with closely verrucose inner walls, 9 to 18 μ in thickness, and thin, smooth outer ones; and the orange-yellow aecidiospores are ellipsoid, ovate, or oblong, 22·5 to 36 by 16·5 to 24 μ, with a colourless epispore 2·5 to 4·2 μ.

KAMEI (S.). **Identification of a peridermial stage on the seedlings of Abies mayriana and the injury caused thereby.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 153–161, 3 figs., 1934.

By means of inoculation experiments the writer traced a genetic

connexion between a white *Peridermium* attacking *Abies mayriana* needles in the Sapporo district of Japan and *Uredinopsis hirosakiensis* on *Dryopteris thelypteris* [*R.A.M.*, xi, p. 813]. The rust is stated to cause considerable damage on nursery seedlings of *A. mayriana*.

LEPIK (E.). **Sõstra-viltrooste geograafilisest levikust.** [On the geographical distribution of the blister rust of White Pine.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu* [*Dorpat*] 21, 7 pp., 2 figs., 3 maps, 1934. [German summary.]

In this paper the author gives a brief outline of the history of the white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, xiii, p. 666 and above, p. 738], followed by a few notes on its early distribution in the northern hemisphere, which at the present day practically coincides with that of the eastern white pine (*Pinus strobus*).

LACHMUND (H. G.) & HANSBROUGH (J. R.). **Survival of blister-rust mycelium in Western White Pine.**—*Journ. Agric. Res.*, xlviii, 11, pp. 1043–1047, 1934.

Following the reports from numerous investigators that squirrels and other rodents frequently eat the infected bark of white pine (*Pinus monticola*) blister rust cankers (*Cronartium ribicola*) [see preceding abstract], and occasionally completely sever the branch at the point of infection, the authors conducted experiments during 1927–8 in British Columbia to obtain definite information on the effect of this phenomenon on the survival of the mycelium of the rust in the branches thus mutilated. The results showed that the stubs of cankered branches which were cut off so as to leave about half an inch of living canker on the tree, remained alive for periods ranging up to five years, or until the mycelium entered the bole of the tree, whereas the stubs of comparable uninfected branches treated in the same way were practically all dead within a year. There was some evidence that the mycelium stimulated a reversal of the flow of assimilates into the stubs from the trunk. The downward growth of the cankers in the cut infected branches proceeded at a constant rate slightly less than that of normal cankers [*R.A.M.*, xiii, p. 606], but was almost identical with that in branches which had been 'flagged' (i.e., whose distal portion had been killed by the canker). On such branches, however, the cankers survived for a shorter time than the cankers that had been experimentally cut.

STOLTENBERG (E.). **Snemugg (sneskytte).** [Snow mould (snow leaf fall).]—Reprinted from *Tidsskr. for Skogbruk*, 7–8, 14 pp., 1934.

A discussion, based on the writer's observations during the last 18 years in west Telemark, Norway, is given of the factors governing the infection of young Scotch firs [*Pinus sylvestris*] by the snow mould (*Phacidium infestans*) [*R.A.M.*, xi, p. 136]. Chief among these appears to be the occurrence of heavy spring snowfalls which form a thick covering over the plants, affording optimum conditions for the development and spread of the fungus.

The mycelium seems to pass direct from one needle to the next, killing them and the buds. The dead needles may remain attached to the branches for some years and thus assist in the spread of the fungus. As a rule the critical stage for infection in the growth of the tree is between the heights of 0·25 and 1·40 m. Ill-nourished trees on poor soil have been found the most susceptible to *P. infestans*. Control should be based on silvicultural methods calculated to improve the vigour of the stands.

BRAID (K. W.). **History of the Bracken disease.**—*Scottish Journ. of Agric.*, xvii, 3, pp. 207–305, 1934.

Four types of the bracken [*Pteridium aquilinum*] disease [*R.A.M.*, xii, p. 139] are recognized, namely, (1) 'hook disease' (possibly the result of frost injury), in which the 3- to 6-inch 'hooks' are soft, semi-rotten, discoloured dark brown or black, and full of bacterial growth; (2) Knoweside type, characterized by general lack of vigour, dwarfing of the fronds, which often bear brownish or black, lozenge-shaped markings on the 'stems', branches, and leaflets, the whole suggestive rather of decline than of active fungal infection; (3) Garelochhead type, the more virulent forms of which are highly destructive [ibid., viii, p. 412] and may be due to an associated fungus which, however, has not been isolated as yet; and (4) the Milngavie type, from which *Corticium anceps* was isolated by Mrs. Gregor [ibid., xii, p. 132].

The first record of the bracken disease appears from a typical specimen in the Kew Herbarium to date back to 1865, but the present investigations were initiated by Mrs. N. L. Alcock, in collaboration with the writer, in 1926.

HUBERT (E. E.). **Tests on the relative resistance of wood to decay.**—*Univ. of Idaho Bull.*, xxix, 7 (*School of Forestry, Bull.* 5), 23 pp., 3 figs., 1934.

In further tests [which are described and the results of which are tabulated and discussed] conducted in Idaho on the relative resistance of different species of commercial wood blocks, wall boards, insulators, sawdust, shavings, and charred wood to attack by *Lenzites trabea* [*R.A.M.*, ix, p. 149; xiii, p. 556] evidence was obtained that the moisture percentage based on oven-dry weight for such products as wall-boards and insulators is not a reliable indicator of the loss in weight due to fungal attack. The effects of water-repellent materials in these products, however, strikingly demonstrated the value of this type of protection. Preliminary tests indicated that charring increases the resistance of wood to decay by *L. trabea*. As before, the difficulty of controlling the various factors influencing the rate of decay prevented exact information being obtained as to the specific resistance of the various timbers tested. A summary is given of the results obtained up to date with *Lentinus lepideus*, *Lenzites sepiaria*, and *L. trabea* on a number of commercial woods and some data are given on the effect of *L. trabea* on *Picea engelmanni* already partially rotted by *Stereum sulcatum* [ibid., xii, p. 605] and on *Abies grandis* rotted by *Echinodontium tinctorium* [ibid., xi, p. 614], which showed

that a loss of weight of 23·8 and 16·2 per cent., respectively, was produced in eight months.

RUDGE (E. A.). **Studies in the decomposition of timber under industrial conditions. VII. Telegraph poles.**—*Journ. Soc. Chem. Ind.*, liii, 28, pp. 208T–211T, 3 figs., 1 diag., 1934.

From an examination of three specimens of decayed telegraph poles, sections through which showed regularly spaced 'ring-shakes' (cracks) containing aluminium and calcium, it is concluded that decomposition is initiated by the presence of moisture in sufficient quantities to maintain free ionic movement within the substance of the wood. Under such conditions the inorganic constituents migrate into zones of high concentration concentric with the annual rings, producing areas of low lateral strength, probably in correlation with the formation of cellulose compounds and degradation products. The subsequent stages of disintegration are associated with a complex series of changes, ultimately involving attacks by micro-organisms and resulting in complete decay [see above, p. 739].

Creosote is effective in the later stages of decay by reason of its fungicidal action, but in the initial phases its efficacy depends entirely on its capacity to exclude the infiltrating ions by sealing the pores of the wood.

Simple visual tests are stated to be useless for the detection of the earlier stages of disintegration due to infiltration, but chemical analysis reveals the abnormally high ash content which is a characteristic feature of ionic intrusion.

VANINE (S. I.) & VLADIMIRSKAYA (Mme N. N.). О действии некоторых газов на грибницу домовых грибов и о глубине проникновения газов в древесину. [On the action of certain gases on the mycelium of house fungi, and on the depth of penetration of gases into wood.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Ser. iv (*Bot. Experimentalis*), Leningrad, *1934*, 1, pp. 205–222, 4 figs., 1934. [German summary.]

This is a somewhat expanded account of the authors' laboratory experiments to test the possibility of controlling house fungi (*Merulius lacrymans* and *Coniophora cerebella*) in buildings by fumigation with gases and volatile substances, such as chlorine, chloro-picrin, acetic acid, etc., and also to determine the depth to which the gases and vapours of these substances penetrate into wood, a report of which has already been noticed [*R.A.M.*, xii, p. 261].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 4, p. 72, 1934.

CHINA. In accordance with an announcement of the Shanghai Tariffs Commissioner, dated 13th February, 1934, specimens of viruses, bacteria, fungi, protozoa, and insects injurious to agriculture may in future only be imported into China by way of Shanghai, and must be accompanied by a special permit from the Ministry of Industry.

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